

Make sure the drill is raised to clear all obstacles before towing or trimming (compressor power).

DURING OPERATION

Make sure the drill guide is raised to clear all obstacles before towing or trimming under compressor power).

Wear safety glasses while drilling, to prevent damage to the eyes.

Use extreme caution when walking alongside the unit while trimming. The propellers are fast-acting during starting and turning.

AFTER OPERATION

When the hydraulic system is not in use, turn off pump to prevent pressure build-up.
Be sure compressor is shut off and pressure in lines released before disconnecting.

ANGE
2

HEADQUARTERS
DEPARTMENT OF THE AIR
WASHINGTON, D.C., 1 December

**Operator, Organizational, Direct and General Support,
and Depot Maintenance Manual**

**DRILL, PNEUMATIC, DRIFTER: BOOM-TYPE;
CRAWLER-MOUNTED; SELF-PROPELLED (INGERSOLL-RAND
MODELS CM150A/D475A AND CM225/D475A)
FSN 3820-854-4149 AND FSN 3820-410-5549**

TM 5-3820-239-15, 25 January 1968, is
changed as follows:

The title is changed as shown above.

Page 1-1. Paragraph 1-1, CM225/D475A is
ed after CM150A/D475A.

Paragraph 1-3a. Delete Ingersoll-Rand Model
150A/D475A.

Page 1-2. Paragraph 1-4a, the following is
ed: MODEL CM225/D475A, CONTRACT
—DSA700-69-C-H056, FSN 3820-410-5549,
TE MFD—1969.

Paragraph 1-4b(1), the following is added:

Model CM225/D475A
Serial No. CL23190 and CL23301 through 23349

Page 1-5. The following data is added to para-
phs indicated:

Paragraph 1-4b(5):

Paragraph 1-4b(15):

Model 1CYL840AA (CM225/D475A)

Paragraph 1-4b(16):

Model 1CYL840AE (CM225/D475A)

Paragraph 1-4b(17):

Model 1CYL840AR (CM225/D475A)

Paragraph 1-4b(18):

Model 1CYL840AF (CM225/D475A)

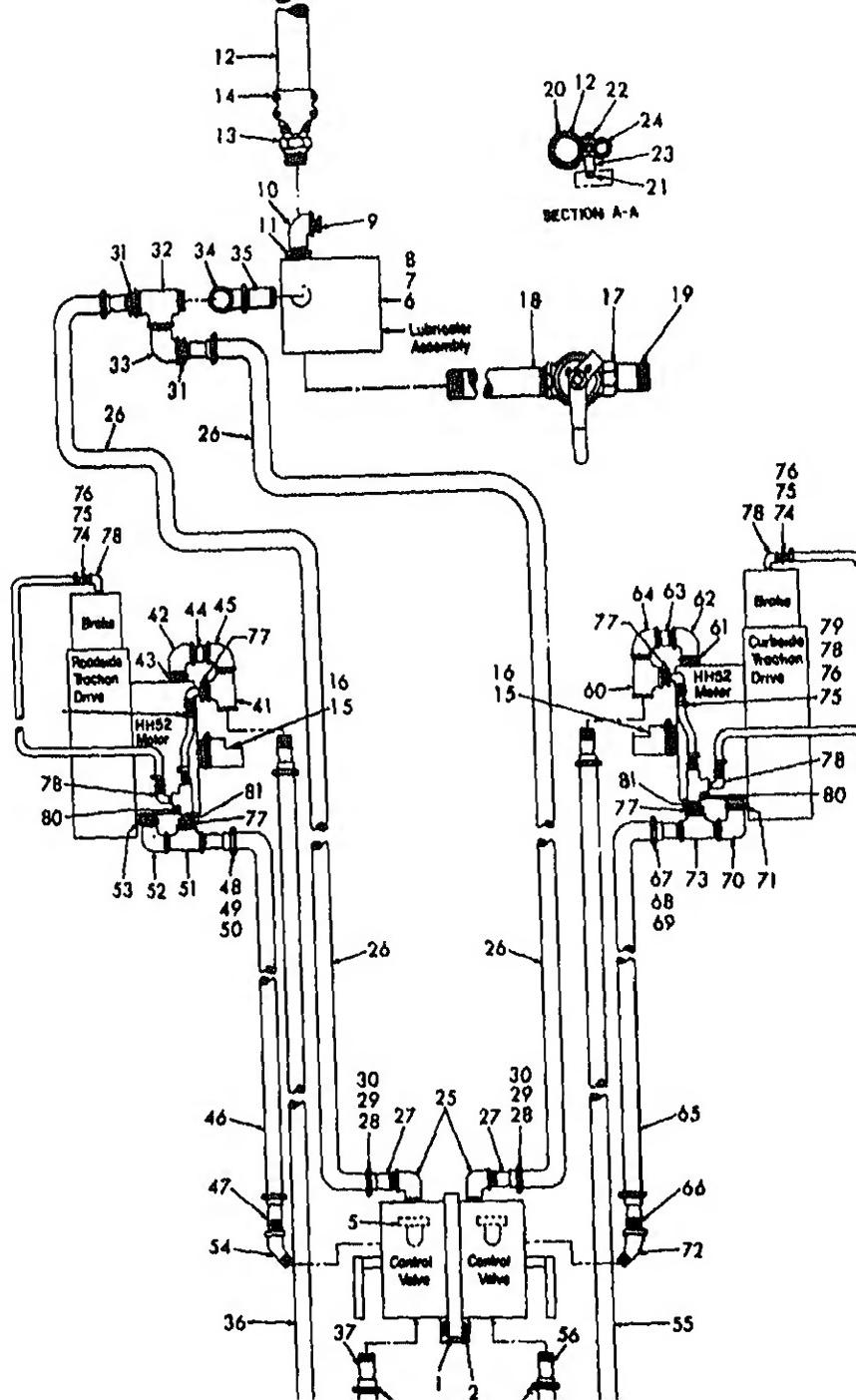
Paragraph 1-4b(19):

Model 1CYL840AC (CM225/D475A)

Page 1-6. Paragraph 1-5 is superseded as
lows:

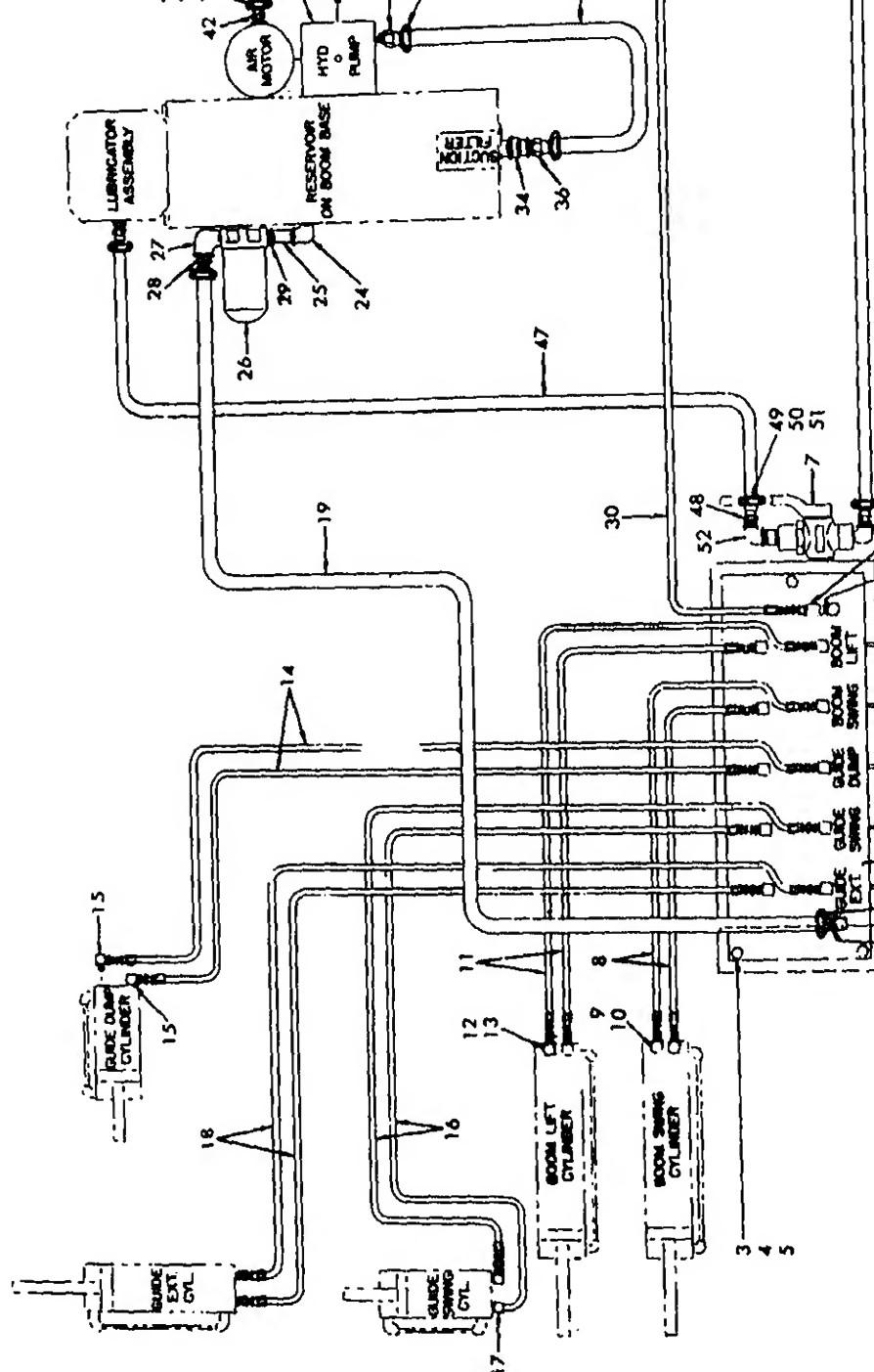
1-5. Difference in Models.

This manual covers the Ingersoll-Rand M
CM150A/D475A and CM225/D475A pneu-
drills. There are differences between the
models in the hydraulic pump coupling sys-



Street elbow, 1 in. NPT x 45° (2)	32 Street tee, 1½ in. NPT	58 Bolt, ¾ in x 2¼ in. lg
Lubricator assembly	33 Street elbow, 1½ in. NPT x 90°	59 Nut, ¾ in. (4)
Bolt, ½ in. x 1½ in. lg (4)	34 Elbow, 1½ in. NPT x 90°	60 Street tee, 1 in. NPT
Nut, ½ in. (4)	35 Nipple, 1½ in. NPT x 3 in. lg	61 Reducing bushing, 1¼ in. NPT
Reducing bushing, 1 in. x ½ in. NPT	36 Air hose, 1 in. x 72 in. lg	62 Street elbow, 1 in. NPT
Street elbow, 1 in. NPT x 90°	37 Hose stem (2)	63 Nipple, 1 in. NPT x 1½ in.
Reducing bushing, 1 in. x 1¼ in. NPT	38 Hose clamp, half (4)	64 Elbow, 1 in. NPT x 90°
Air hose, 2 in. x 17 ft 6 in. lg	39 Bolt, ¾ in. x 2¼ in. lg (4)	65 Air hose, 1 in. x 32 in.
Hose stem (2)	40 Nut, ¾ in. (4)	66 Hose stem (2)
Hose clamp (2)	41 Street tee, 1 in. NPT	67 Hose clamp, half (4)
Hose, deflector (2)	42 Street elbow, 1 in. NPT x 90°	68 Bolt, ¾ in. x 2¼ in. lg
Hose clamp (2)	43 Reducing bushing, 1¼ in. x 1 in. NPT	69 Nut, ¾ in. (4)
Main air valve	44 Nipple, 1 in. NPT x 1½ in. lg	70 Street elbow, 1 in. NPT
Nipple, 2 in. NPT x 6 in. lg	45 Elbow, 1 in. NPT x 90°	71 Reducing bushing, 1¼ in. NPT
Nipple, 2 in. NPT x 2½ in. lg	46 Air hose, 1 in. x 32 in. lg	72 Street elbow, 1 in. NPT
Hose clamp, half (2)	47 Hose stem (2)	73 Street tee, 1 in. NPT
Stud, ½ in. x 4 in. lg	48 Hose clamp, half (4)	74 Air hose, ¼ in. x 22 in.
Nut, ½ in.	49 Bolt, ¾ in. x 2¼ in. lg (4)	75 Hose nipple (8)
Pipe, ½ in. NPT x 1¼ in. lg	50 Nut, ¾ in. (4)	76 Hose clamp (8)
Coupling, ¾ in. NPT x 1½ in. lg	51 Street tee, 1 in. NPT	77 Reducing bushing, ¼ in. NPT (4)
Street elbow, 1 in. NPT x 90° (2)	52 Street elbow, 1 in. NPT x 90°	78 Street elbow, ¼ in. NPT (6)
Air hose, 1 in. x 32 in. lg (2)	53 Reducing bushing, 1¼ in. x 1 in. NPT	79 Air hose, ¼ in. x 12 in.
Hose stem (4)		80 Shuttle valve, ¼ in. NPT
		81 Nipple, ¼ in. NPT x ¾ in.

Page 1-13. Figure 1-5.1 is added



- 14 Hydraulic hose assembly (2)
 15 Elbow (2)
 16 Hydraulic hose assembly (2)
 17 Elbow (2)
 18 Hydraulic hose assembly (2)
 19 Hydraulic hose
 20 Hose stem (2)
 21 Hose clamp, half (4)
 22 Bolt, $\frac{3}{8}$ in. \times $1\frac{1}{4}$ in. lg (4)
 23 Nut, $\frac{3}{8}$ in. (4)
 24 Street elbow, $\frac{3}{4}$ in. NPT \times 90°
 25 Nipple, $\frac{3}{8}$ in. NPT \times $2\frac{1}{2}$ in. lg (2)
 26 Oil filter (2)
- 27 Street elbow, 1 in. NPT \times 90°
 28 Reducing bushing, 1 in. \times $\frac{1}{2}$ in.
 NPT
 29 Reducing bushing, 1 in. \times $\frac{3}{4}$ in.
 NPT
 30 Hydraulic hose assembly
 31 Elbow
 32 Nipple, $\frac{3}{8}$ in. NPT \times 1 in. lg
 33 Flow control valve, $\frac{3}{8}$ in. NPT
 34 Reducing coupling, 1 in. \times $\frac{3}{8}$ in.
 NPT
 35 Hydraulic hose
 36 Hose stem
 37 Hose clamp, half (4)
 38 Bolt, $\frac{3}{8}$ in. \times $1\frac{1}{4}$ in. lg (4)
 39 Nut, $\frac{3}{8}$ in. (4)
- 40 Hose stem
 41 Hydraulic hose
 42 Hose stem (2)
 43 Hose clamp, half
 44 Bolt, $\frac{3}{8}$ in. \times $1\frac{1}{4}$
 45 Nut, $\frac{3}{8}$ in. (4)
 46 Street elbow, $\frac{1}{2}$
 47 Hydraulic hose
 48 Hose stem (2)
 49 Hose clamp, half
 50 Bolt, $\frac{3}{8}$ in. \times $1\frac{1}{4}$
 51 Nut, $\frac{3}{8}$ in. (4)
 52 Elbow, $\frac{3}{8}$ in. NPT

Paragraph 3-13b is superseded.

- b. Using a grease gun, fill each fitting until grease is forced out through the seals.

Page 6-43. Paragraph 6-52.1 is added.

6-52.1. Disassembly (Model CM225/D475A)

- a. *Power Dump and Swing Assembly.* Refer to paragraph 6-52a.

b. *Hydraulic Cylinders.*

NOTE

The hydraulic cylinders are similar in construction. For maintenance purposes, a typical cylinder will be covered. Differences in the check valve parts do not affect the instructions appreciably.

(1) Remove capscrews (1, fig. 6-20.1) and lockwashers (2).

(2) Using a suitable spanner wrench, unscrew retainer ring (17).

NOTE

The retainer ring cannot be completely removed when unscrewed, since it may not fit over the fitting of the piston rod assembly.

(3) Slide piston rod assembly (19), with all parts attached, out of barrel assembly (29).

lock pin, backup ring, and tool for repairing the hydraulic cylinder parts are not available separately. They are furnished in a service kit. F
TM 5-3820-239-35P

Paragraph 6-55.1 is added.

6-55.1. Reassembly (Model CM225)

- a. *Hydraulic Cylinders.*

NOTE

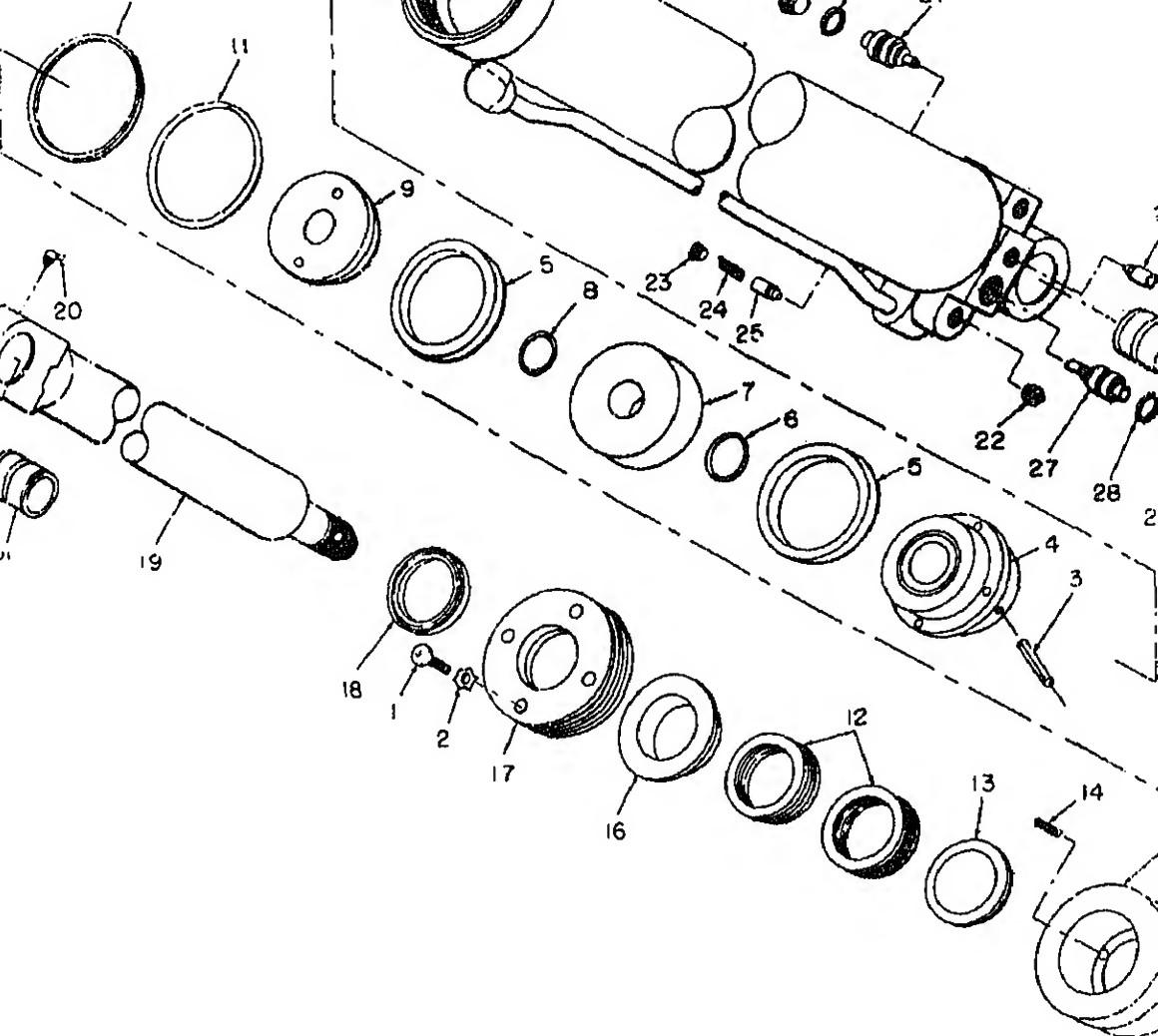
Coat all parts with clean hydraulic fluid aid in reassembly.

(1) Install all check valve parts in figure 6-20.1.

(2) Slide rod wiper (18), retainer and gland nut (16) onto piston rod (19).

(3) Install springs (14), male adapter and V-packing (12) into cylinder. Mount O-ring (11) and backup ring on cylinder head, and slide the assembled piston rod assembly (19). Install lock pin to retain the parts.

b. *Power Dump and Swing Assembly.* Refer to paragraph 6-55c.



ME 3820-239-15/6

1 O-ring
2 Lock washer
3 Lock pin
4 Rear backing plate
5 U-cup
6 O-ring
7 Piston
8 Gland

11 O-ring
12 V-packing
13 Male adapter
14 Spring
15 Cylinder head
16 Gland nut
17 Retainer ring
18 Rod wiper

21 Bushing
22 Pipe plug
23 Pipe plug
24 Spring
25 Poppet
26 Pipe plug
27 Pilot check piston
28 Piston ring

*Major General, United States Army,
The Adjutant General.*

Distribution:

To be distributed in accordance with DA Form 12-25B (qty rqr Block No. 385), Operator requirements
Drilling Machine.

**Operator's, Organizational, Direct Support and General
Support Maintenance Manual**
DRILL, PNEUMATIC, DRIFTER:
BOOM TYPE; CRAWLER-MOUNTED; SELF-PROPELLED
(INGERSOLL-RAND MODELS CM150A/D475A
AND CM225/D475A)
FSN 3820-854-4149
AND
FSN 3820-410-5549

TM 5-3820-239-15, 25 January 1968, is changed as follows:

Page 2-1. Paragraph 2-2.1. is added after graph 2-2.

The title is changed as shown above.

Cover. Inside the front cover, the following is added to the BEFORE OPERATION SAFETY PRECAUTIONS: "Drill should not be operated without striker bars."

Page ii. In the table of contents, Appendix B is rescinded.

2-2.1. Maintenance and Operating Supplies

Refer to table 2-1 for a complete list of nance and operating supplies required fo operation of the drill.

Table 2-1. Maintenance and Operating Supplies

(1)	(2)	(3)	(4)	(5)
(1)	(2)	(3)	(4)	(5)
FINAL DRIVE (1)	Federal stock number	Description	Quantity required for initial operation	Notes
HYDRAULIC SERVOIR.	Chargement application	LUBRICATING OIL GEAR: 5 gal drum as follows: GO-90 GOS	3 qt 3 qt	(1) Includes quantity for both units. (2) See C9100-11 for data and require- ments. (3) See current LO application and re- placement intervals.
MANIFOLD LUBRICATOR	BRICATOR	OIL LUBRICATING: 8 gal drum as follows: OEID OE:30	40 qt (4)	(4) Reserve oil capac- ity per hour of (5) Average oil con- sumption.
AIR FEED MOTOR (1)		OIL LUBRICATING: 8 gal drum as follows: OE-30 OE-10 OIS	8 qt (4) 8 qt (4) 8 qt (4)	(5) Average oil con- sumption.
PROPELLING AIR OTOR. (1)		LUBRICATING 5 gal drum as follows: GO-90 GOS	(3)	(3)
STEEL BITS		OIL LUBRICATING 5 gal drum as follows: OE-30 OE-10	2 qt 2 qt	(3)
CASE POINTS		GREASE, MOLYBDENUM DISUL- FIDE: 5 lb can, GMD.	(3)	(3)
		GREASE, AUTOMOTIVE AND ARTILLERY: 5 lb can, GAA.	(3)	(3)

Page 2-7. Subparagraph 2-11c.1 is added after subparagraph 2-11c(2)(f).

c.1. Installing the shank piece (striker bar).

(1) Loosen the chuck jaw retainer bolts and remove the chuck jaw retainer.

(2) Insert the shank end of the striker bar in the drill chuck.

(3) Slide the chuck jaw retainer over the end of the striker bar and bolt it to the front head of the drill.

CAUTION

Operation of the drifter drill without the striker bar should not be attempted.

Page 2-9. Immediately after subparagraph 2-11d

Operating it in only the forward (counter-clockwise) direction for a minimum period of 5 minutes.

Page 3-5. Subparagraph 3-9c is superseded follows:

c. Fill with rock drill oil, MIL-L2104B, as necessary.

Page 3-9. In figure 3-7(2), TRACK ROLLER FITTINGS is changed to read "TRACK ROLLER GREASE FITTINGS."

Page A-1. In paragraph A6:

TB 740-93-2 is changed to read "TB 740-93-2"

TP 740-93-3 is changed to read "TM 740-93-3"

Page B-1. Appendix B is rescinded.

Distribution:

To be distributed in accordance with DA Form 12-25B (qty rqr block No. 385) Operator
nance Requirements for Earth Drilling Machine.

**Operator, Organizational, Direct and
General Support, and Depot Maintenance Manual**
DRILL, PNEUMATIC, DRIFTER:
BOOM-TYPE; CRAWLER-MOUNTED; SELF-PROPELLED
(INGERSOLL-RAND MODEL CM150A/D475A)
FSN 3820-854-4149

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APPENDIX A. REFERENCES

- B. BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES**
- C. MAINTENANCE ALLOCATION CHART**

INDEX

CHAPTER 1

INTRODUCTION

Section I. GENERAL

Scope

These instructions are published for use personnel to whom the Ingersoll-Rand Model CM150A/D475A pneumatic drills are issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapters 4 through 6 provide information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized for operator of this equipment, and the list of maintenance and operating supplies required for initial operation. Appendix C contains the maintenance allocation chart. Organizational, direct and general support, and depot maintenance repair parts and special tools are listed M 5-3820-239-20P and 35P.

c. Numbers in parenthesis following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred sequence.

d. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 Recommended Changes to DA Publications, forwarded direct to the Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd., St. Louis Mo. 63120.

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, and organization maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard 46 (United States Government motor vehicle identification card) which is carried by the operator, should be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND TABULATED DATA

Description

General. The Ingersoll-Rand Model CM150A/D475A pneumatic drill (fig. 1-1) is a self-propelled, compressed air operated, crawler-mounted, boom-type drifter drill. It is used for drilling holes in rocklike formations. The unit is designed to drill both vertical and horizontal holes up to 12 inches in diameter.

portable compressor capable of supplying 1 cfm (cubic feet per minute) of air at 90 psi (pounds per square inch), and a 2-inch diameter hose are required to supply all operating power needed for drilling and trammimg (propulsion).

b. Trammimg. The pneumatic drill traction unit (fig. 1-1) is equipped with two 5-ton hydraulic jacks which will raise the unit

below.

c. *Towing the Pneumatic Drill.* The traction drive allows the propelling air motors to be declutched and the brake deactivated for towing. In this way, the tracks turn freely when the pneumatic drill is being towed to a new location. The tow hitch (fig. 1-2) provides a convenient connection point for towing purposes.

d. *Propelling Controls.* The propelling controls (fig. 1-2) are mounted on a propelling control arm which can be mounted in one of three locations for operator convenience. If the operator desires to stand on the operator's platform while tramping, the controls are mounted on a fixed bracket on top of the boom base (fig. 1-2). If the operator desires to walk either alongside or behind the pneumatic drill, the propelling controls are attached to a propelling control arm which can be swiveled to the side or to the rear of the unit. The propelling controls consist of two identical control valves, each of which controls one track independently of the other. The valves can be moved either forward or back, and are spring-returned to the center (off) position for safety. The independent action of each valve permits turning in a smaller radius than would normally be possible in a unit of this size.

e. *Drifter Drill Positioning.* The hydraulic boom assembly (fig. 1-1) consists of several hydraulically-operated (boom lift and boom swing) cylinders which position the entire drill guide and power dump and swing assembly as required for drilling operations. The complete range of boom travel is 100° in a horizontal direction and 82° in a vertical direction. The power dump and swing assembly (fig. 1-1) consists of a dump cylinder and swing cylinder which hydraulically position the drill guide at the desired drilling angle. The power dump and swing assembly permits a full 180° vertical

by a chain drive. The power gear mounting contains a drill guide extender which is hydraulically controlled by the hydraulic valve (fig. 1-2) to lower the guide in order to place the foot piece against the ground for added stability. The drill itself is operated from the rear manifold, which has five valves, four of which are used. A rotation selector valve selects the drifter drill in the desired direction. A drill feed control valve moves the drill up and down. A drill throttle controls the speed of drilling. A blow-off valve allows air to clean out the hole.

1-4. Identification and Tabulated Data

a. *Identification.* The Ingersoll-Rand CM150A/D475A pneumatic drill has a major identification plate. The information contained on the plate is listed below.

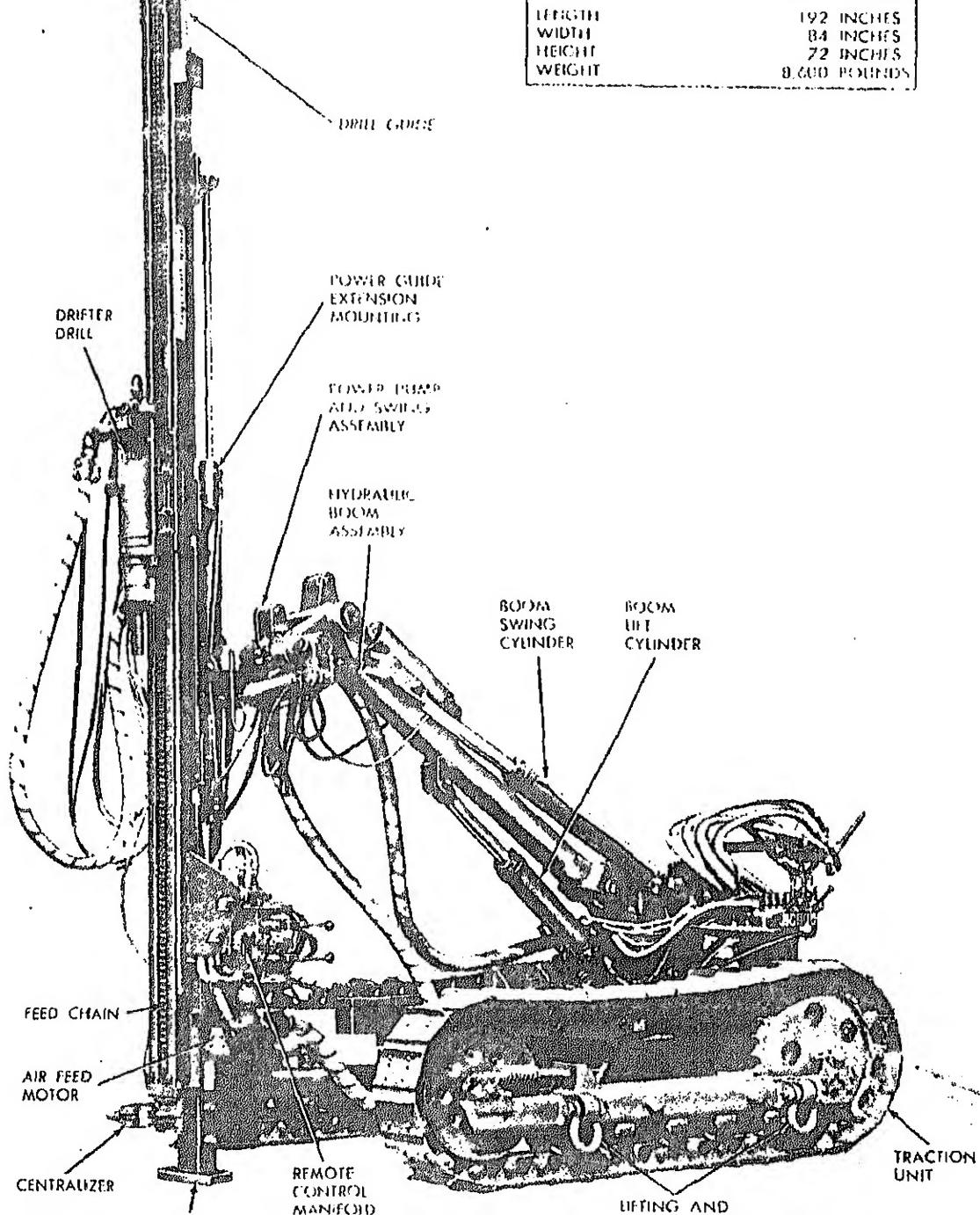
U.S. Army
Drill, pneumatic, drifter
MODEL—CM150A/D475A
CONTR NO.—DAAK01-67-C-10096
SER
CAPACITY
REG NO.
FSN 3820-854-4149
GVW 8,600 LB
LG—192 IN.
HGT—72 IN.
W—84 IN.
SHIP WT—8,600 LB
CUBE—700 FT ³
DATE MFD—1967
ENG SER
WARRANTY
DATE SHIPPED
DATE INSP
INSP STAMP
MFD BY—Ingersoll-Rand

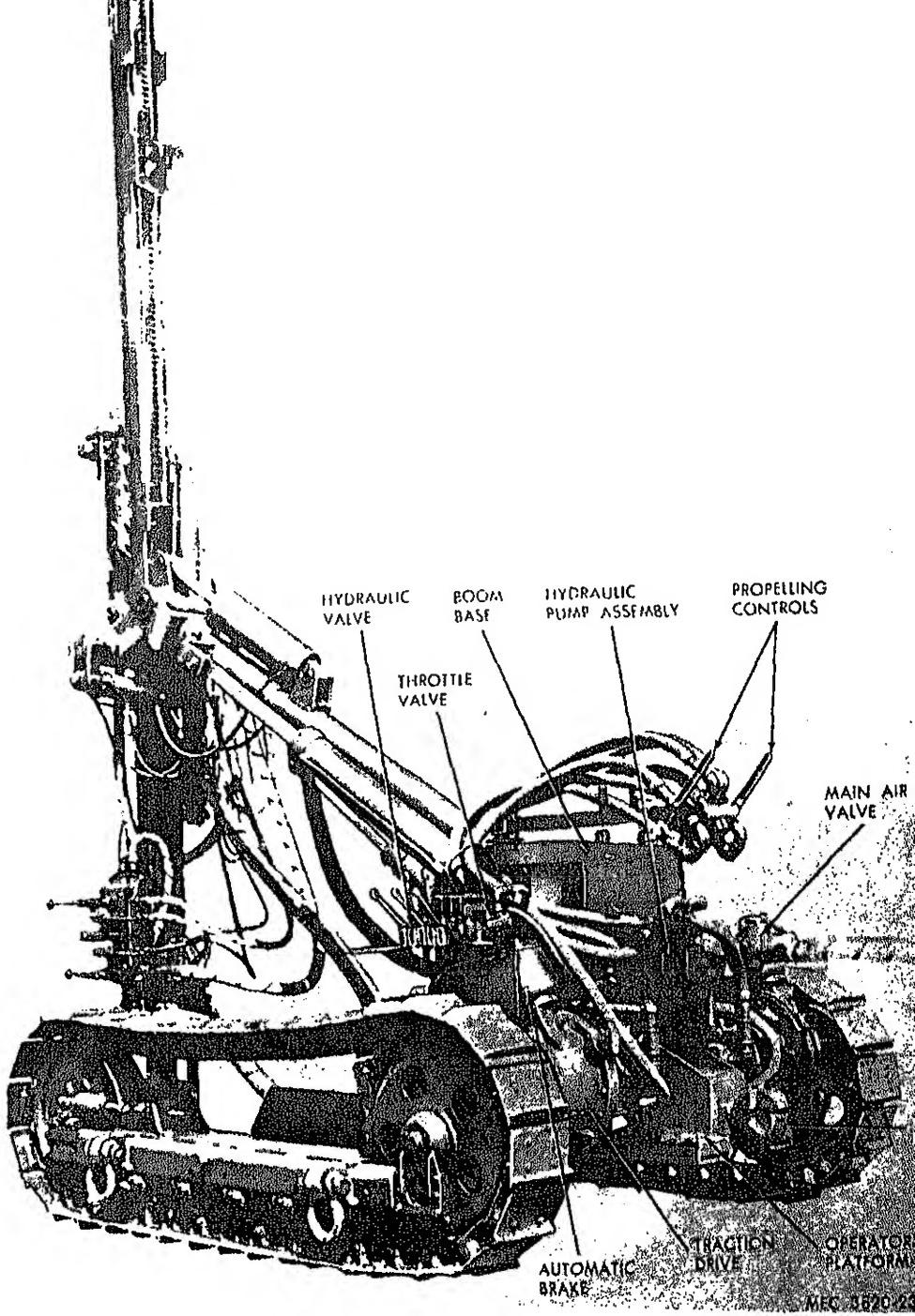
b. *Tabulated Data.*

(1) *Pneumatic drill.*

Manufacturer _____ Ingersoll-Rand
Model No. _____

LENGTH	192 INCHES
WIDTH	84 INCHES
HEIGHT	72 INCHES
WEIGHT	8,600 POUNDS





(3) Tow hitch.	Manufacturer	Holland-Hitch Co	relief poppet
	Model	.760-1	
(4) Hydraulic pump.	Manufacturer	Vickers, Inc.	
	Model	V110-15-1A-10-LHS85	
	Type	Vane	
(5) Hydraulic pump coupling.	Manufacturer	Link Belt Co	
	Model	RC-5010	
	Type	Flexible	
(6) Propelling air motors.	Manufacturer	Ingersoll-Rand	
	Model	HH52	
(7) Drill steel centralizer.	Manufacturer	Ingersoll-Rand	
	Model	A45CM150A	
(8) Drill feed chain.	Manufacturer	Link-Belt Co	
	Model	RC80SU	
	Type	Roller	
(9) Throttle valve.	Manufacturer	Hose Accessories Co	
	Model	LE-HI VF-50	
	Size	1/2 in. NPT	
(10) Return line oil filter.	Manufacturer	Vickers, Inc.	
	Model	OFM-101	
	Size	1 in. NPT	
(11) Main air valve.	Manufacturer	Homestead Valve Mfg Co	
	Model	1112	
	Size	2 in.	
(12) Drain plugs.	Manufacturer	Lisle Corp	
	Type	Magnetic	
(13) Air feed motor assembly.	Manufacturer	Ingersoll-Rand	
	Model	128CM150A	
(14) Propelling motor control valve.	Manufacturer	Galland-Henning Nopak	
	Div		
			(16) Dump cylinder.
	Manufacturer	Benton Harbor Eng	
		ing Works Inc	
	Model	1CYL640K	
	Type	Hydraulic with ther	
		relief poppet	
			(17) Swing cylinder.
	Manufacturer	Benton Harbor Eng	
		ing Works Inc	
	Model	1CYL640J	
	Type	Hydraulic with ther	
		relief poppet	
			(18) Boom lift cylinder.
	Manufacturer	Benton Harbor Eng	
		ing Works Inc	
	Model	1CYL640G	
	Type	Hydraulic with ther	
		relief poppet	
			(19) Boom swing cylinder.
	Manufacturer	Benton Harbor Eng	
		ing Works Inc	
	Model	1CYL640F	
	Type	Hydraulic with ther	
		relief poppet	
			(20) Nut and bolt torque data.
	Return line oil filter	12 to 15 ft-lb (foot	
	mounting bolt.	pounds)	
	Traction unit sprocket	150 ft-lb	
	stud nuts.		
	Pipe plugs		
	1/8 in.	15 to 20 ft-lb	
	1/4 in.	40 to 50 ft-lb	
	3/8 in.	90 to 100 ft-lb	
	1/2 in.	140 to 150 ft-lb	
	5/8 in.	180 to 200 ft-lb	
	9/4 in.	240 to 250 ft-lb	
	1 in.	340 to 350 ft-lb	
	Bolts and nuts (thread		
	size).		
	No. 2	2 in.-lb (inch-pound)	
	No. 3	3 in.-lb	
	No. 4	4 in.-lb	
	No. 6	8 in.-lb	
	No. 8	16 in.-lb	

7/8 in.	140 to 160 ft-lb
1 in.	200 to 210 ft-lb
1 1/8 in.	280 to 300 ft-lb
1 1/4 in.	380 to 400 ft-lb
1 3/8 in.	430 to 470 ft-lb
1 1/2 in.	500 to 550 ft-lb

(21) Dimensions and weight (fig. 1-1).

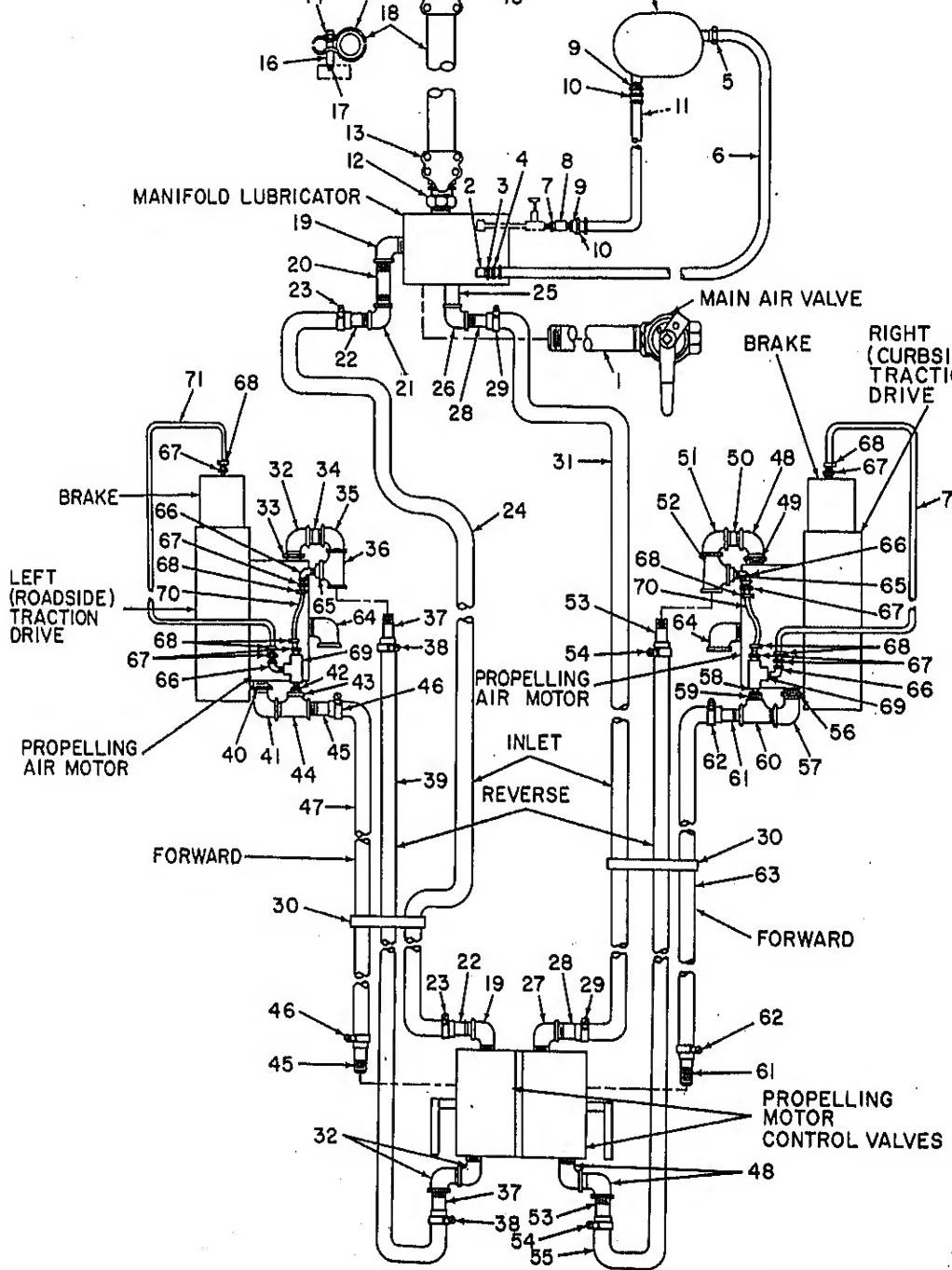
Overall height (guide vertical).	16 ft (feet)
Overall length (less boom and guide).	8 ft, 10 in.
Rack width	7 ft
Rack length	8 ft, 8 in.

Figure 1-4 for drill control program.

- (23) *Hydraulic piping diagram.* See 1-5.

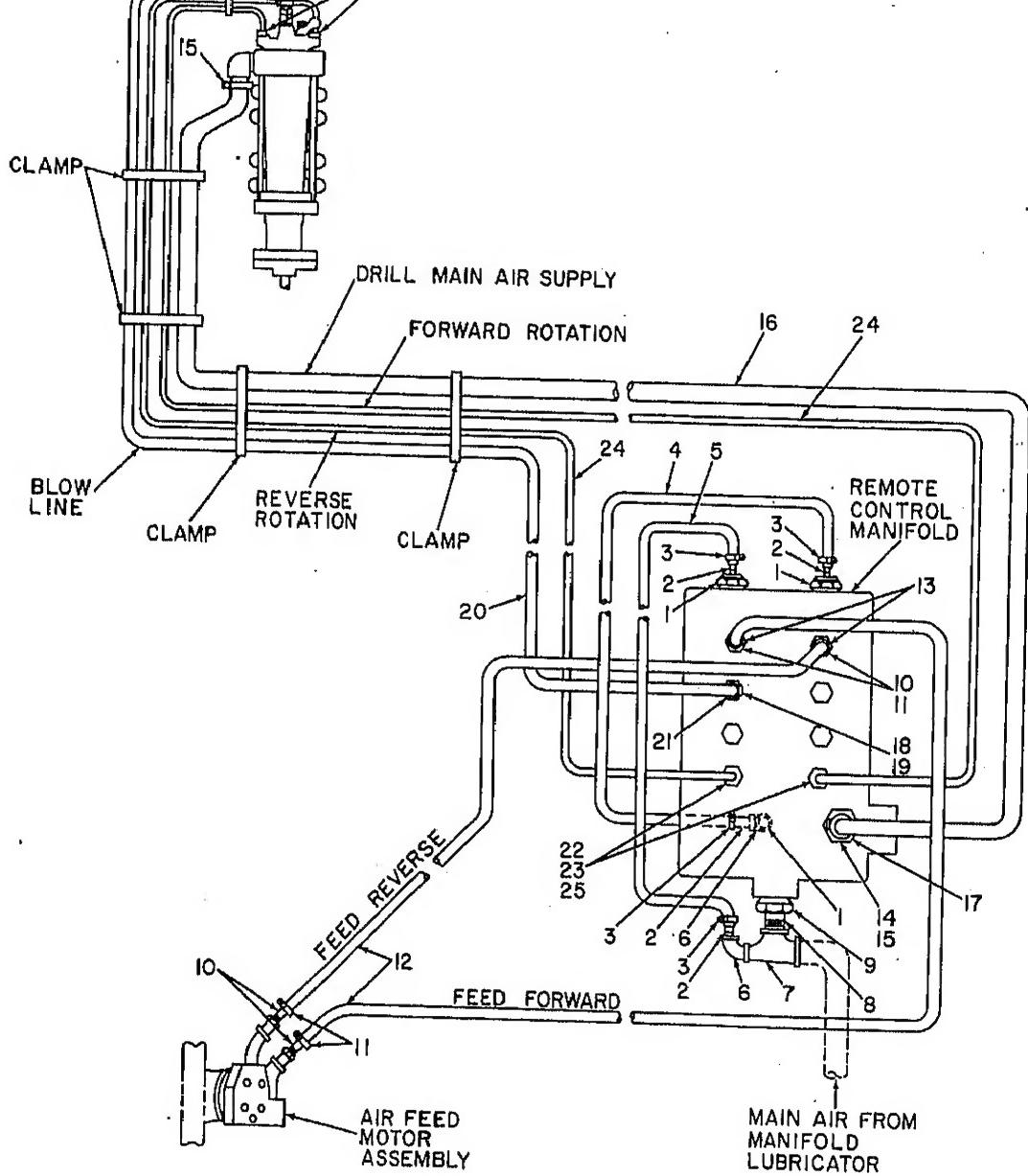
1-5. Difference in Models

This manual covers only the Ingersoll Model CM150A/D475A pneumatic drill. Known unit differences exist for those covered by this manual.



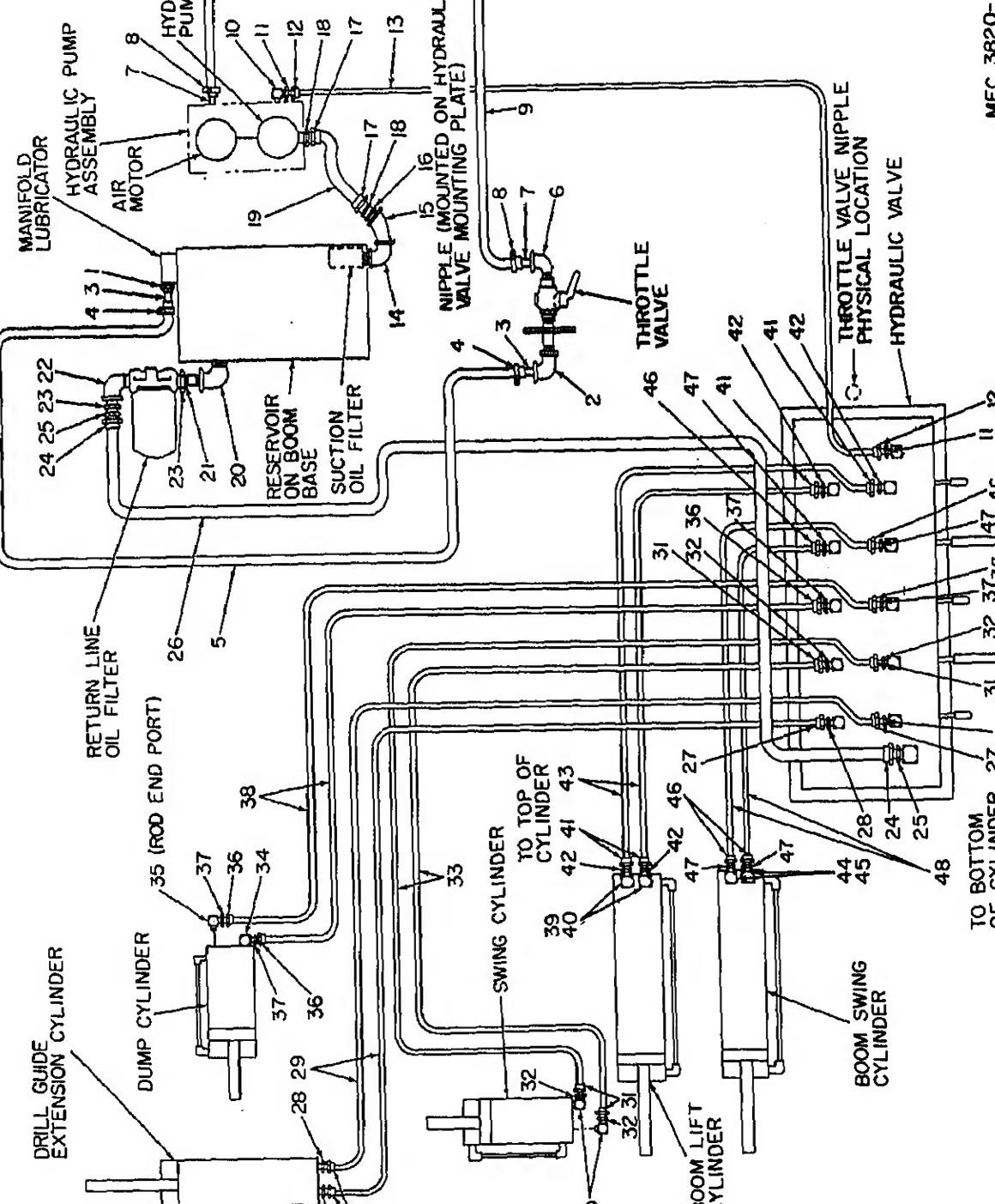
8	Coupling, 3/8 x 1 8/16 in.	43	Reducing bushing, 1 to 1/4 in.
9	Adapter (2)	44	Street tee, 1 in.
10	Universal swivel (2)	45	Hose stem (2)
11	Hose, 21 in.	46	Hose clamp (2)
12	Hose stem (2)	47	Air hose, 1 in. x 6 ft
13	Hose clamp (2)	48	Street elbow, 90° x 1 in. (8)
14	Stop nut, 1/2 in.	49	Reducing bushing, 1 1/4 to 1 in.
15	Hose clamp half (2)	50	Nipple, 1 x 1 1/2 in.
16	Pipe, 1/2 x 1 1/4 in.	51	Elbow, 90° x 1 in.
17	Stud, 1/2 x 4 in.	52	Street tee, 1 in.
18	Air hose, 2 in. x 17 1/2 ft	53	Hose stem (2)
19	Street elbow, 90° x 1 in. (2)	54	Hose clamp (2)
20	Nipple, 1 x 5 in.	55	Air hose, 1 x 108 in.
21	Elbow, 90° x 1 in.	56	Reducing bushing, 1 1/4 to 1 in.
22	Hose stem (2)	57	Street elbow, 90° x 1 in.
23	Hose clamp (2)	58	Close nipple, 1/4 x 7/8 in.
24	Airhose, 1 in. x 7 1/2 ft	59	Reducing bushing, 1 to 1/4 in.
25	Nipple, 1 x 2 in.	60	Street tee, 1 in.
26	Elbow, 90° x 1 in.	61	Hose stem (2)
27	Street elbow, 90° x 1 in.	62	Hose clamp (2)
28	Hose stem (2)	63	Air hose, 1 x 93 in.
29	Hose clamp (2)	64	Street elbow, 90° x 1 1/4 in. (2)
30	Hose clamp, 2 1/8 ID x 2 1/2 OD x 3/4 in. thk (6)	65	Reducing bushing, 1 to 1/4 in. (2)
31	Air hose, 1 in. x 7 1/2 ft	66	Street elbow, 90° x 1/4 in. (4)
32	Street elbow, 90° x 1 in. (3)	67	Hose nipple, 1/4 in. (8)
33	Reducing bushing, 1 1/4 to 1 in.	68	Hose clamp, 1/4 in. (8)
34	Nipple, 1 x 1 1/2 in.	69	Shuttle valve (2)
35	Elbow, 90° x 1 in.	70	Air hose, 1/4 x 12 in. (2)
		71	Air hose, 1/4 x 22 in.

Figure 1-8—Continued.



- | | | | |
|----|------------------------------------|----|----------------------------------|
| 7 | Reducing tee, 2 x 2 x 3/4 in. | 20 | Air hose, 8/4 in. x 17 ft |
| 8 | Nipple, 2 x 2 in. | 21 | Reducing bushing, 1 to 8/4 in. |
| 9 | Reducing bushing, 2 1/2 to 2 in. | 22 | Adapter (4) |
| 10 | Hose stem, 3/4 in. (4) | 23 | Swivel (4) |
| 11 | Hose clamp (4) | 24 | Air hose, 8/8 in. x 18 ft (2) |
| 12 | Air hose, 8/4 x 30 in. (2) | 25 | Reducing bushing, 8/4 to 8/8 in. |
| 13 | Reducing bushing, 1 to 3/4 in. (2) | | |

Figure 1-4—Continued.



3 bushing, 1 to 1/2 in. /2 in. x 90°	18 Adapter (2)
in., 1/2 x 66 in. bow, 1/2 in. x 90°	19 Hose, 3/4 x 9 in.
in., 1/2 in. (2) imp (2)	20 Street elbow, 3/4 in. x 90°
, 1/2 x 51 in. /64 in. dia restriction orifice x 90° ting (2)	21 Nipple, 3/4 x 2 1/2 in.
in. long. in. x 90°	22 Street elbow, 1 in. x 90°
bowl, 1 in. x 45° bushing, 1 to 3/4 in. ting (2)	23 Reducing bushing, 1 to 3/4 in. (2)
	24 Hose fitting (2)
	25 Adapter (2)
	26 Hose, 3/4 x 56 in.
	27 Hose fitting (4)
	28 Adapter (4)
	29 Hose, 181 in. long (2)
	30 Elbow, with 3/64 in. dia restriction orifice (2)
	31 Hose fitting (4)
	32 Adapter (4)
	33 Hose, 151 in. long (2)
3 bushing, 1 to 1/2 in. /2 in. x 90°	34 Elbow
in., 1/2 x 66 in. bow, 1/2 in. x 90°	35 Elbow, with 3/64 in. dia restriction of 36 Hose fitting (4)
in., 1/2 in. (2) imp (2)	37 Adapter (4)
, 1/2 x 51 in. /64 in. dia restriction orifice x 90° ting (2)	38 Hose, 151 in. long (2)
in. long. in. x 90°	39 Reducing bushing, 1/2 to 3/8 in. (2)
bowl, 1 in. x 45° bushing, 1 to 3/4 in. ting (2)	40 Elbow (2)
	41 Hose fitting (4)
	42 Adapter (4)
	43 Hose, 45 in. long (2)
	44 Reducing bushing, 1/2 to 3/8 in. (2)
	45 Elbow (2)
	46 Hose fitting (4)
	47 Adapter (4)
	48 Hose, 33 in. long (2)

Figure 1-5—Continued.

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

Unloading Equipment

The pneumatic drill is equipped with two lifting and tie down lugs (fig. 1-1) on each side of the track frame for crane handling. In unloading the unit from the flatcar or trailer bed, use a spreader bar located over the center of gravity (fig. 2-1).

Warning: Do not attempt to lift the pneumatic drill unless the drill guide is positioned downward. If this procedure is not followed, unbalancing of the load may occur which can cause damage to the equipment and severe injury to personnel in the area.

Unpacking Equipment

The pneumatic drill is shipped completely assembled and is not packed in any exterior containers or crates.

Inspecting and Servicing Equipment

Refer to the basic issue items list (app. B) and check for the presence of all required materials. Check all parts for insecure mounting. Tighten all loose mounting screws and caps. Refer to paragraph 8-6 for daily preventive maintenance services to be performed. Visually check the pneumatic drill for missing parts and for damage that may have occurred during shipment. Carefully check all hoses and fittings for abrasion and tightness.

Installation of Separately Packed

2-5. Installation or Setting up Instructions

a. Location.

(1) Towing.

(a) If the pneumatic drill is to be towed to the desired worksite, disengage the clutch on each propelling air motor by pulling the clutch lock pin handle (fig. 2-2) out to the retracted position, and turn the handle to lock it in this position.

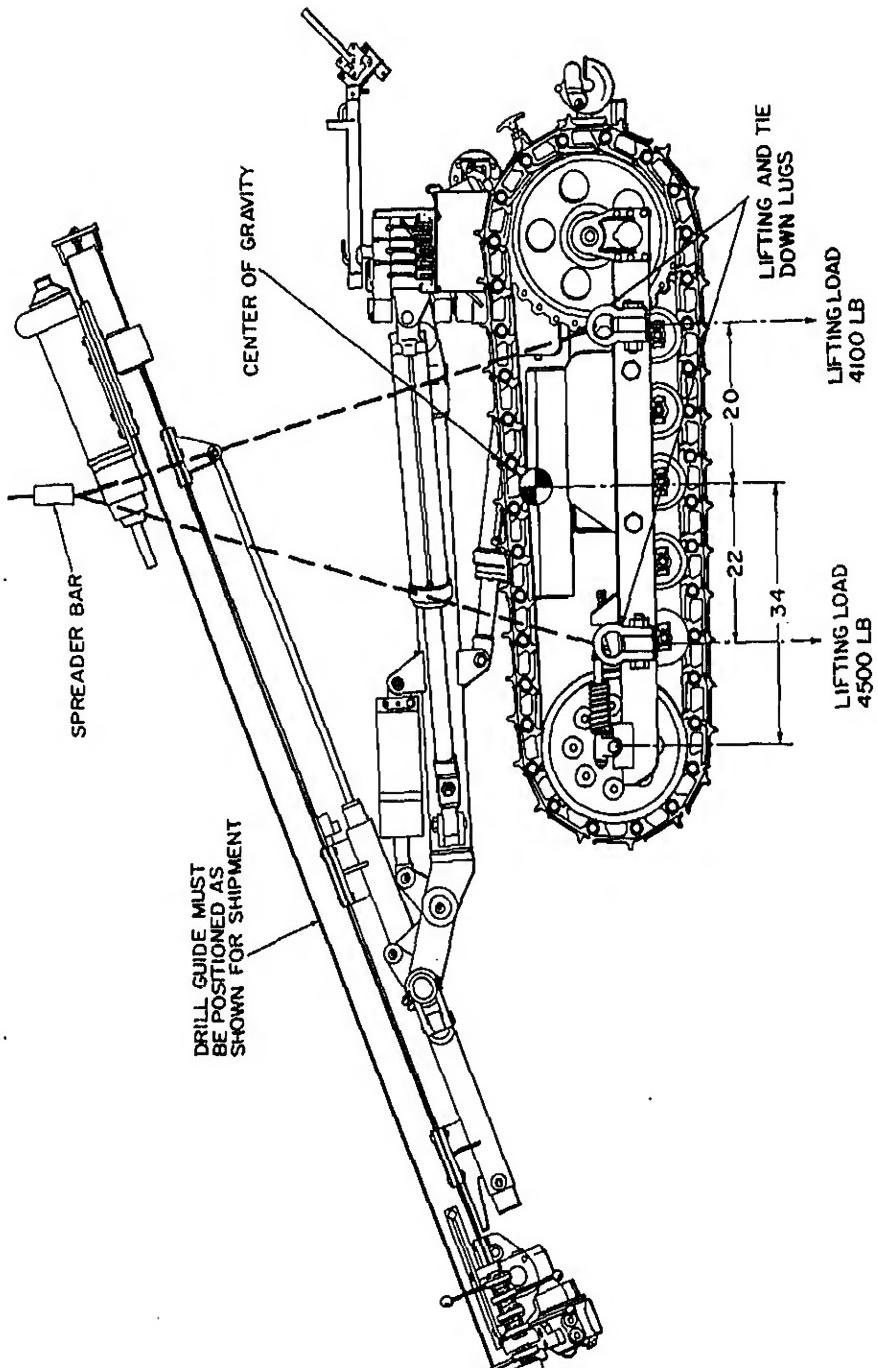
Caution: If the clutches are not disengaged before towing, damage to the internal parts of the unit will occur.

(b) Release the automatic brakes on the propelling air motors by turning in (clockwise) the set screw (fig. 2-2) on each brake cylinder. Tighten the locknut to retighten the setting.

Caution: Do not tow the pneumatic drill at speeds greater than 4 mph (miles per hour). Be sure that the drill guide is clear enough to clear obstacles.

(2) Tramming.

(a) Engage the clutch on each propelling air motor by releasing the clutch lock pin handle (fig. 2-2). Turn the handle either right or left until it releases and locks. If the lock pin does not snap



NOTE:
ALL DIMENSIONS
ARE IN INCHES

aligned with the pin. Refer to paragraph 2-5b for connections required.

Warning: If the clutch lock pin handle is engaged when air is directed to the propelling air motors, the unit will move forward quickly. Under no circumstances attempt to pull the propelling motor control handle back to cause reverse tramping while standing near the clutch.

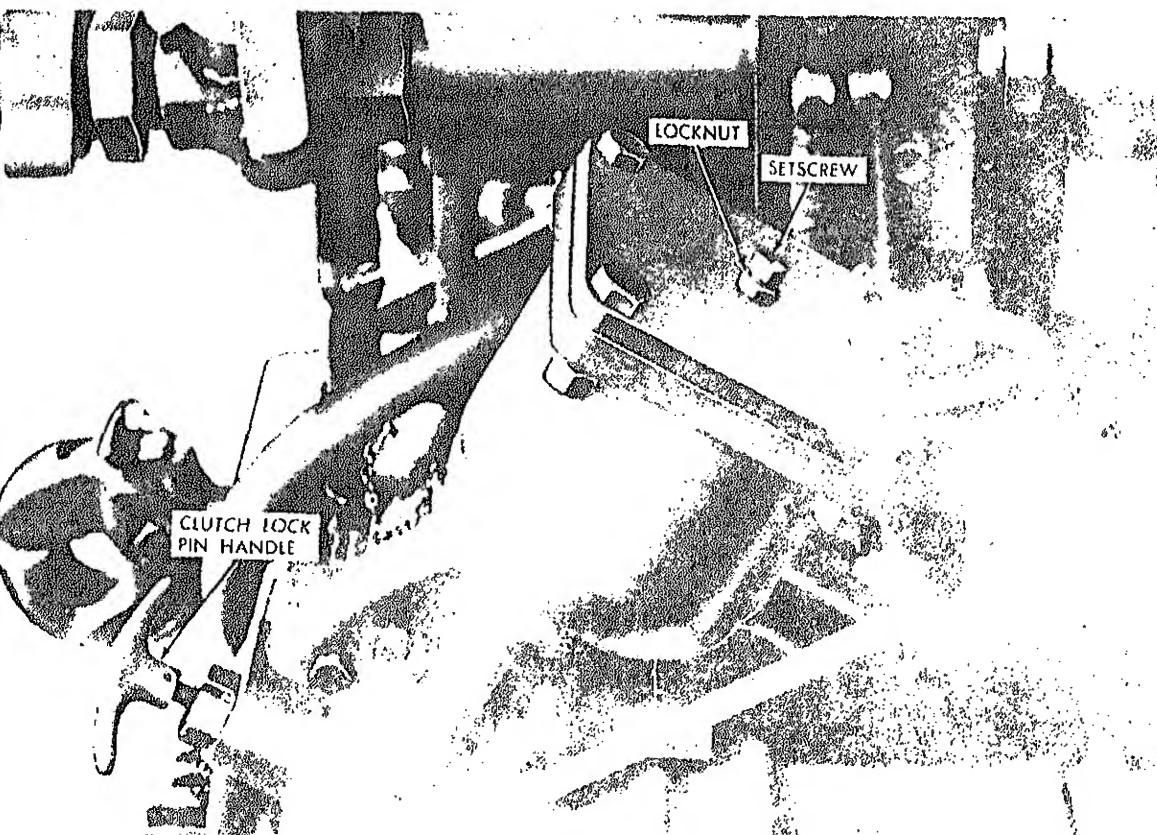
- (b) Set the propelling motor automatic brakes by unscrewing (counter-

clockwise) the setscrew (fig. 2) on each brake cylinder. When setscrew is free of piston do not tighten the locknut to retain setting.

Caution: Be sure that the guide is raised high enough to clear obstacles.

b. *Connections.*

- (1) Blow out the main air hose from compressor, to assure that all foreign material is removed from the line. If the hose is new, coat the inside



- air pressure loss.
- (2) Disconnect the 1 1/2 inch main hose at the drifter drill and blow out the line for several minutes to remove trapped moisture and dirt.

Caution: If the air hose is new, allow the compressor to run with the hose disconnected from the drifter

properly coated with oil (the valve must be open).

- (3) Connect the hoses and fittings for tightness.

c. *Lubrication.* Before attempting to move the unit, make sure that the pneumatic drill is properly lubricated. Refer to paragraph 3-1 for preventive maintenance services.

Section II. MOVEMENT TO NEW WORKSITE

2-6. Dismantling for Movement

a. If the pneumatic drill is to be moved a short distance by tramping, no dismantling is required. Follow the procedures of paragraph 2-5a(2).

b. If the pneumatic drill is to be moved by towing, disconnect the compressor hose, and use the tow hitch located at the rear of the

unit (fig. 1-2). Follow the procedures of paragraph 2-5a(1). For longer distances or when moving by truck or trailer, it is necessary to transport by rail or trailer. It is necessary to position the drill guide as shown in figure 1-2 before lifting.

2-7. Relocation After Movement

Refer to paragraph 2-5 for procedures.

Section III. CONTROLS AND INSTRUMENTS

2-8. General

This section describes, locates, illustrates and furnishes operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for

proper operation of the pneumatic drill.

2-9. Controls and Instruments

The purpose of controls and instruments and their normal settings are illustrated in figures 2-3.

Section IV. OPERATION OF EQUIPMENT

2-10. General

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the pneumatic drill.

b. The operator must know how to perform every operation of which the pneumatic drill is capable. This section gives instructions on starting and stopping the pneumatic drill, basic motions of the pneumatic drill, and on coordinating basic motions to perform specific tasks.

the operator may have to vary guidance to fit the individual job.

2-11. Starting

a. General.

- (1) Perform necessary daily maintenance services (fig. 2-1).
- (2) Turn on main air valve.

b. Tramping.

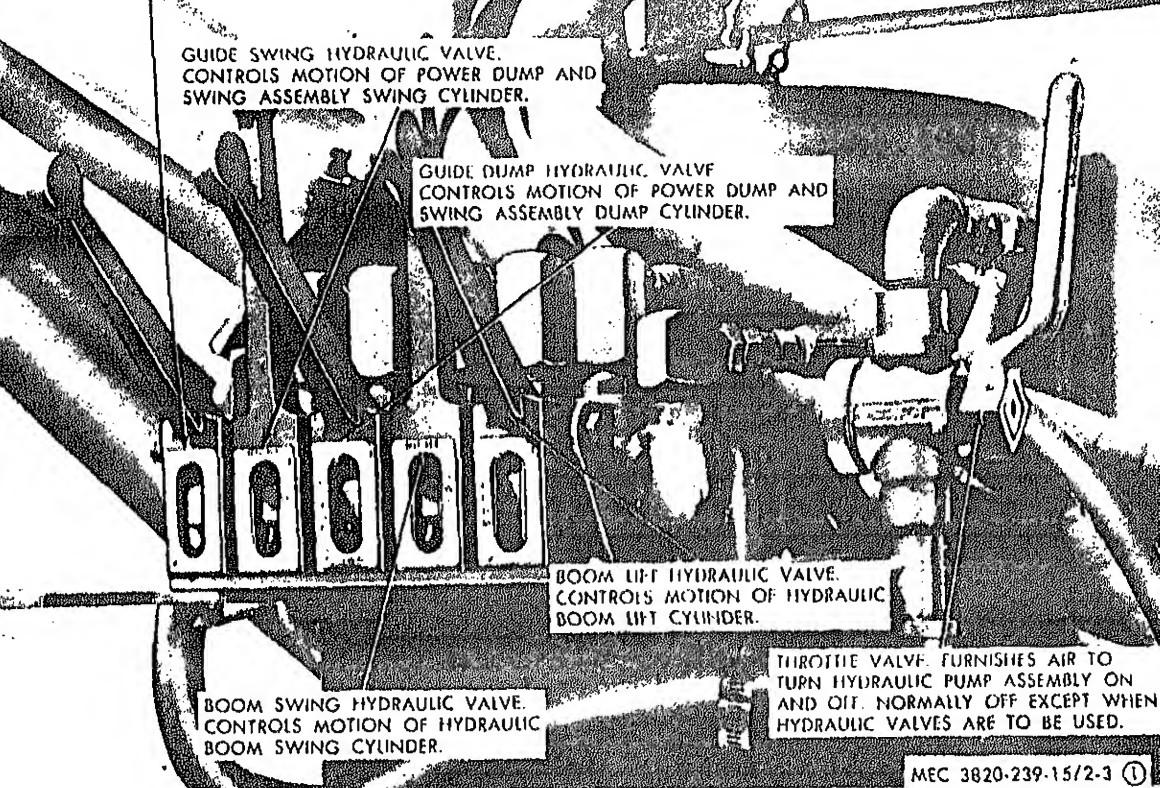
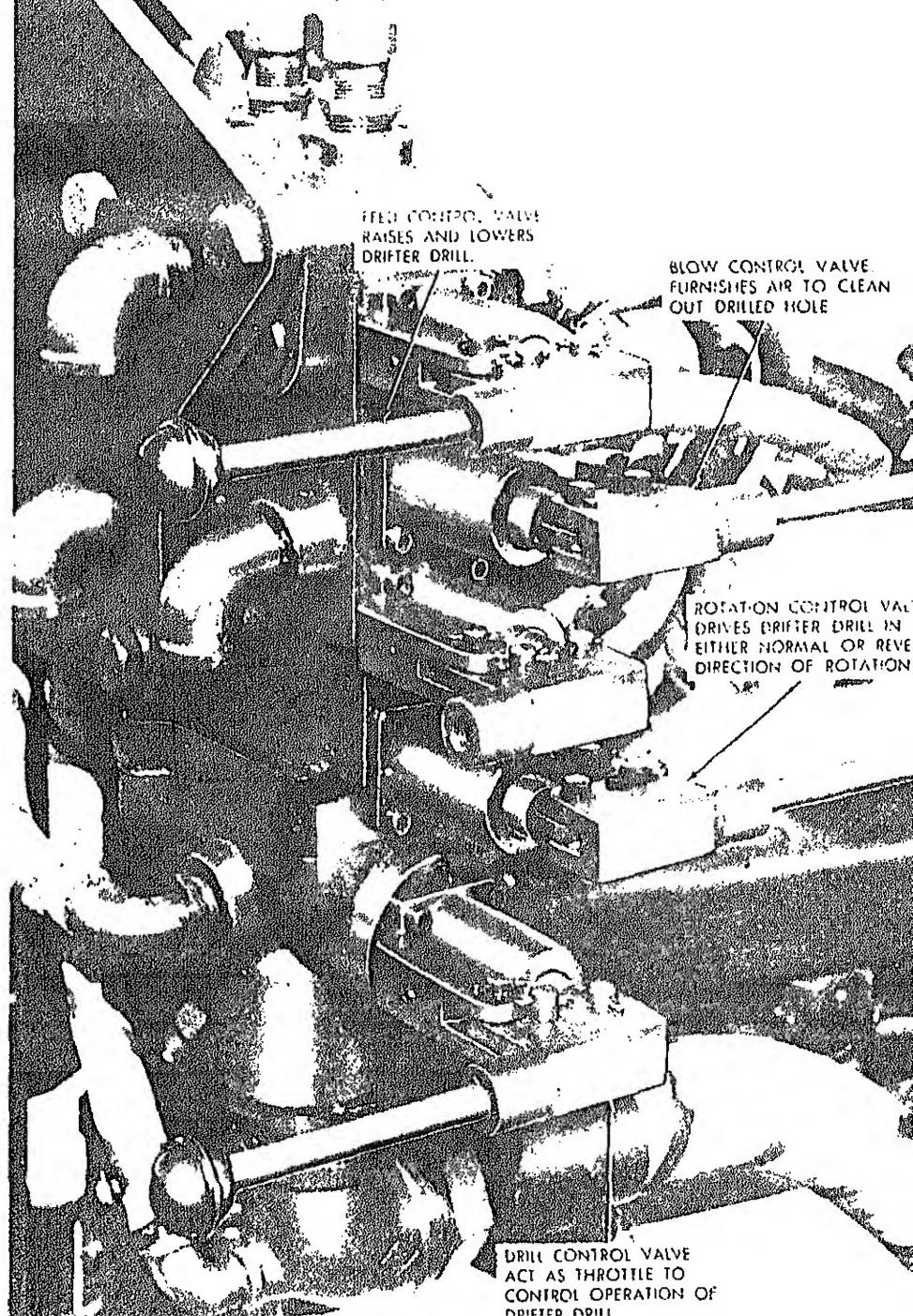


Figure 2-3(1). Controls and instruments.

- (2) Follow the propelling procedure as follows:
 - (a) To propel straight forward—push both control handles forward at the same time.
 - (b) To propel in reverse—pull both control handles toward operator at the same time.
 - (c) To make a sharp left turn—push the right hand control handle forward and pull the left hand control toward the operator at the same time.
 - (d) To make a sharp right turn—push the left hand control handle for-

- trol handle toward operator at same time.
 - (e) To make a gradual right turn—push the left hand control handle forward, allow the right hand control handle to remain in neutral.
 - (f) To make a gradual left turn—push the right hand control handle forward, allow the left hand control handle to remain in neutral.
 - (g) Care should be exercised as propelling motors are fast acting especially in starting and turning.
- c. Positioning the Drill Guide.
- (1) Turn on the hydraulic pump by



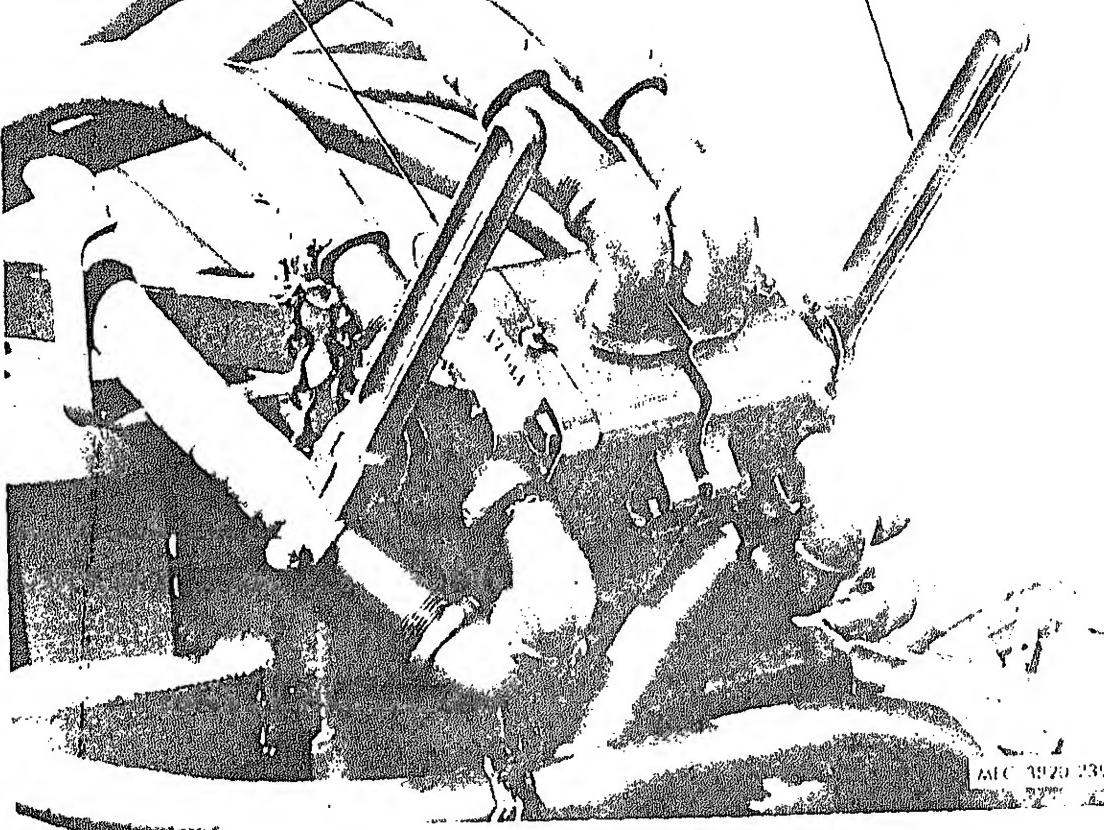


Figure 2-3(3)—Continued.

so that the handle is in the same direction as the piping.

- (2) Position the drill guide as required by following the procedure:

(a) To raise the boom—move the boom lift lever to the "UP" position. To lower the boom—move the boom lift lever to the "DOWN" position.

(b) To move the boom to the right—move the boom swing lever to the "RIGHT" position. To move the boom to the left—move the boom swing lever to the "LEFT" position.

"UP" position. To tilt guide down—move the guide lever to the "DOWN" position.

(d) To swing the drill guide right—move the guide swing lever to the "RIGHT POSITION". To swing the drill guide to the left—move the guide swing lever to the "LEFT POSITION".

(e) To raise the drill guide—move the guide extension lever to the "UP" position. To lower guide—move the guide extension lever to the "DOWN" position.

(f) Turn off pump when hydraulic controls by

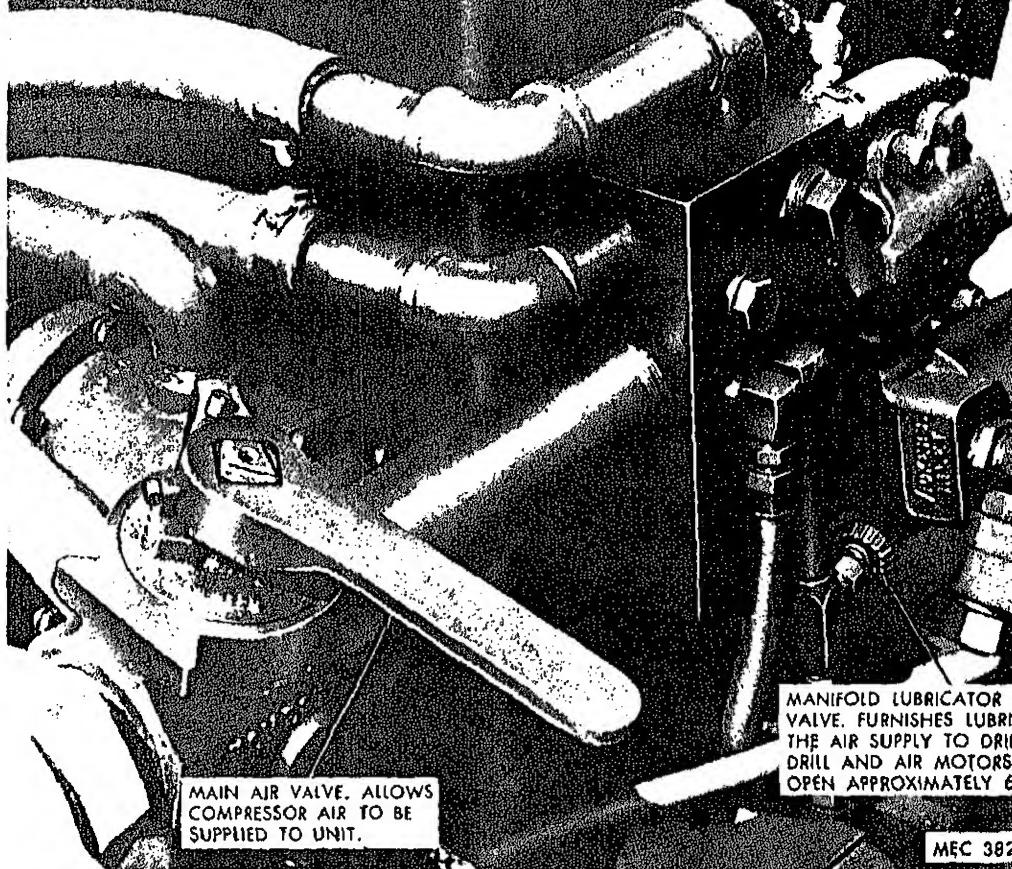


Figure 2-3(4)—Continued.

d. Drilling.

- (1) Open the valve on the manifold lubricator (fig. 2-3) by following the procedure:
 - (a) Turn the valve handwheel in a clockwise direction until the valve is completely closed.
 - (b) Open the valve six complete turns by turning the handwheel in a counterclockwise direction.
 - (c) Start the drill. After a few minutes check to see if the following condi-

2. A bluish oil mist in the drill exhaust

If the above coexist, the needle va additional adjustin

- (d) To increase the f the needle valve l terclockwise.
- (e) To decrease the f the needle valve l wise.

- lubricator for oil, and connect main air line. If drill is new, remove air hose at drill and turn on air supply when oil vapor emerges from hose. Reconnect hose to drill.
- (b) Install drill steel & bit in drill and close centralizer arms above bit.
- (c) Position drill guide to the desired drilling location. Extend the power guide extension cylinder until the foot piece is firmly against the drilling face.
- (d) Turn drill blow control on, use the feed motor control to move drill until bit is just above rock. Put rotation control in forward. Turn on drill control to rotate bit slowly. Feed bit down into rock and collar hole.
- (e) After collaring hole, turn drill control on full and adjust feed to allow steel to rotate freely.
- (f) After hole is bottomed, shut off drill. Use the drill blow control to clean out hole. After hole is cleaned, shut off all air blow, and retract drill steel from hole.
- (g) If needed, add another drill steel to deepen hole or move drill to next position for new hole as required and repeat cycle.

Adding Extension Rods.

- Shut off the drill control at the remote control manifold.
- Use the feed control to retract the drill to free the bit from the bottom of the hole.
- Place the ROTATION control in the neutral position to stop rotation.

Caution: The drill power can be used to loosen couplings but this procedure is not recommended.

- loose on the shank piece.
- (6) Shut off the DRILL control.
- (7) Place the ROTATION selector in the reverse position.
- (8) Use the FEED control to raise the drill, allowing the shank piece to drop clear of piston action. Keep the shank piece clear of hammer range when using reverse rotation to unscrew threads. Threads can be damaged by the hammer blows when not in full contact.
- (9) Operate the DRILL control at part throttle to unscrew the shank piece from the coupling.
- (10) Shut off the DRILL control.
- (11) Retract the drill to the top of the drill guide.
- (12) Lubricate the threads at both ends of the coupling.
- (13) Screw a coupling on one end of the extension rod by hand.
- (14) Align the extension rod and coupling with the shank piece and screw the other end into the coupling resting on the centralizer.
- (15) Screw the coupling to the shank piece by hand, as tightly as possible.
- (16) Place the ROTATION selector in the conventional (left-hand) rotation position, and operate the DRILL control at part throttle to tighten up the extension rod at both ends.

Caution: Do not use the hammer control to tighten parts since damage to threads on the shank piece and extension rod may occur if the shank piece is struck before the threads are in full contact.

- (17) Repeat the entire procedure for each extension rod added.

d. Use the FEED control to lower the drill, and hold the bit at the bottom of the hole under normal feed pressure.

e. Move the DRILL control on and off in short bursts until the coupling is loose on the shank piece.

f. Shut off the DRILL control.

g. Place the ROTATION selector in the reverse position.

h. Open the centralizer arms and feed the drill up the drill guide.

i. Stop the drill feed when the coupling clears the top of the centralizer.

j. Close the centralizer arms and feed the drill down until the coupling rests on top of the centralizer.

k. Operate the DRILL control at part throttle to unscrew the drill steel from the coupling resting on the centralizer, and the coupling on the shank piece.

l. Stop rotation and feed the drill down the drill guide until the shank piece engages the coupling resting on the centralizer.

m. Place the ROTATION selector in the conventional (left-hand) rotation position and screw the shank piece into the coupling. Do not screw the joint tight.

n. Repeat the procedure to remove successive sections of drill steel.

o. Shut off the main air valve and disconnect the bell hose if operation is complete. Shut off the compressor.

p. Perform the necessary daily preventive maintenance services (para 3-6).

2-13. Operation Under Usual Conditions

a. Start the pneumatic drill as described in paragraph 2-11a.

b. Operate the pneumatic drill as described in paragraph 2-11b through 2-11e.

Warning: Wear a respiratory mask at all times during drilling operations, to prevent inhaling dust.

a. Keep lubricating oil reservoir full at all moisture condensation in the

b. Use grade OES lubricant for proved performance in cold weather.

c. Be sure the compressor is warmed up before drilling.

d. Avoid sharp bends in hoses. Bend them with care. They may be damaged by extreme temperatures.

e. Check all exhaust ports for frost formation. Defrost as necessary.

Warning: Do not touch surfaces with bare hands. The unit gets very hot to the metal surfaces at operating temperatures.

2-15. Operation in Extreme Weather Conditions

a. Where possible, take advantage of natural barriers to keep the unit out of the sun.

b. Inspect hoses frequently for deterioration due to excessive heat or cold.

2-16. Operation in Dusty or Windy Areas

a. Shield the unit from direct exposure to natural barriers which protect it from blowing sand or dust.

b. Strain lubricating oil and air before adding to the manifold and hydraulic reservoir, respectively. Make sure vessels are clean, and take care to avoid dust or grit getting into the system during refilling process.

c. Blow all air hoses out before connecting them to the pneumatic drill.

d. Take extra care to make sure the air is emerging from the drill pipe when performing drilling operations.

e. Between operating periods, cover the unit if possible or seal it with cloth or tape.

Operation In Salt Water Areas

Avoid contact with salt water as much as possible since it is highly corrosive. Wash with water to remove salt.

Exercise extreme care to prevent salt water particles from entering lubricant filters, as salt retards the rust preventive and increases the corrosive effect of salts.

Paint exposed metallic surfaces if paint has chipped off or otherwise removed. Exposed ferrous metal surfaces with

internal parts.

2-19. Operation at High Altitudes

Since air pressure decreases with increasing altitude, the following air consumption multipliers are provided for various altitudes in order that the compressor output can be readjusted. The following are based on a multiplier of 1.000 at sea level (0 feet).

- a. 1,000 ft; multiplier 1.032
- b. 2,000 ft; multiplier 1.065
- c. 5,000 ft; multiplier 1.174
- d. 10,000 ft; multiplier 1.391

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment

No special tools or equipment are required by operator or organizational maintenance personnel for maintenance of the pneumatic drill.

3-2. Basic Issue Tools and Equipment

Repair parts issued with or authorized for use with the pneumatic drill are listed in the basic issue items list, Appendix A, manual.

Section II. LUBRICATION

3-3. General Lubrication Information

For the current lubrication order, LO 5-8820-289-12, refer to DA Pamphlet 810-4 (Military Publications).

3-4. Detailed Lubrication Information

a. *General.* Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Do not allow any dust, dirt, or other foreign matter to come in contact with the lubricants. Keep all lubrication equipment clean and ready for use.

b. *Cleaning.* Keep all external parts that do not require lubrication free of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. *Points of Lubrication.* Service the lubrication points at proper intervals as specified on LO 5-3820-289-12.

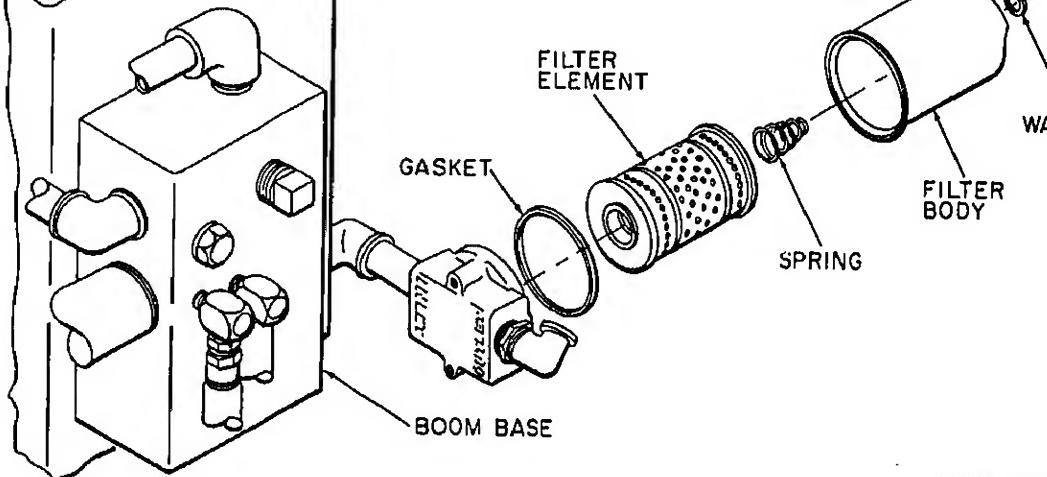
d. *OES Oil.*

(1) When using grade OES oil in cold conditions of extreme cold, check the oil level frequently, as the oil consumption may increase.

(2) This oil may require changing more frequently than usual because contamination by dilution and water formation will increase under weather operation conditions.

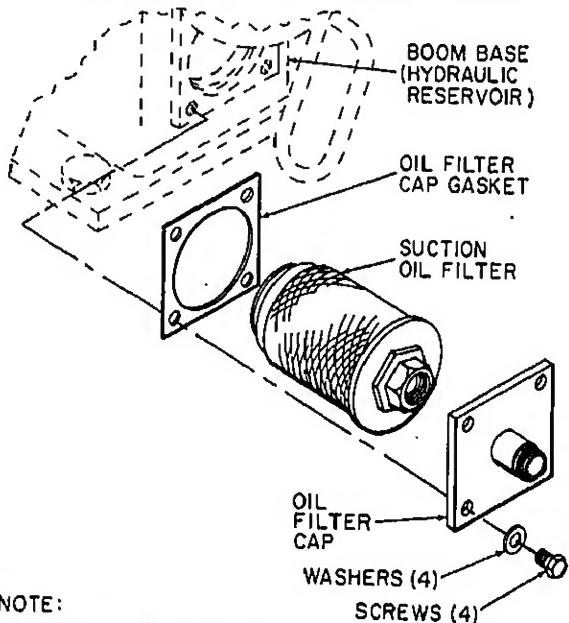
e. *Oil Filter Service.* Refer to figure 8-3 and service the return line oil filter. Refer to figure 8-3 and service the suction oil filter.

Note. This service is performed only when cleaning and flushing the hydraulic reservoirs. See section VI.



MEC 3820

Figure 3-2. Return line oil filter service.



NOTE:

SERVICE AFTER EACH
1000 HOURS OF OPERATION
(WHEN FLUSHING RESERVOIR).
CLEAN FILTER ELEMENT
WITH APPROVED SOLVENT
AND BLOW DRY

MEC 3820-239-15/3-3

Figure 3-3. Suction oil filter service.

on at all times, it must be inspected
fully so that defects may be discovered
and corrected before they result in serious
failure. The necessary preventive
services to be performed are listed
in paragraphs 3-6 and 3-7. Item
numbers indicate the sequence of minimum
requirements. Defects discovered
during operation of the unit shall be noted for
correction, to be made as soon as oper-
ation is suspended. Stop operation immediately if
any defect is noticed which would damage the
unit if operation were continued. All de-
ficiencies and shortcomings will be recorded to
the corrective action taken on DA
(Equipment Inspection and Main-
tenance Worksheet) at the earliest possible

Preventive Maintenance Services

Graph contains an illustrated tabu-

lized listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-4 for the daily preventive maintenance services.

3-7. Quarterly Preventive Maintenance Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

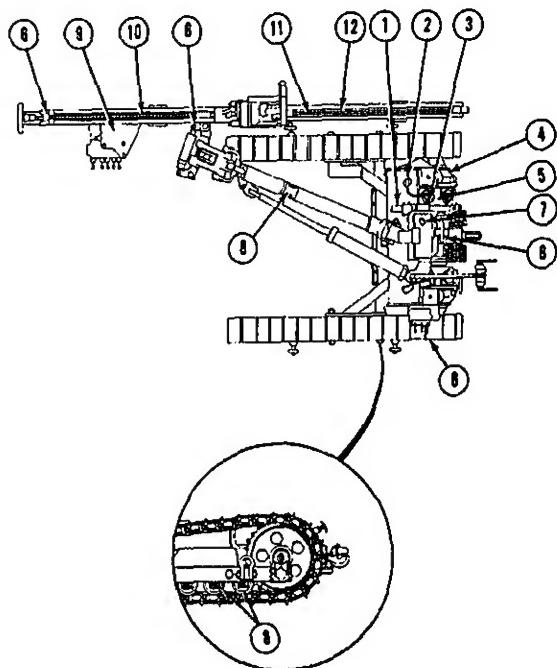
b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-5 for the quarterly preventive maintenance services.

**PREVENTIVE MAINTENANCE SERVICES
DAILY**

TM 5-3820-239-15

INGERSOLL-RAND MODEL
CM150A/D475A

PNEUMATIC D



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM

PA

1	<u>HOSES AND FITTINGS.</u> CHECK HOSES FOR CONDITION. MAKE SURE CONNECTIONS ARE TIGHT.	3
2	<u>LUBRICATING OIL RESERVOIR.</u> CHECK OIL LEVEL.	3
3	<u>LUBRICATOR METERING VALVE.</u> ADJUST FLOW TO DRILL.	3
4	<u>TRACTION DRIVE PLANET GEAR HOUSING.</u> CHECK OIL LEVEL.	3
5	<u>PROPELLING AIR MOTORS.</u> CHECK OIL LEVEL.	3
6	<u>LUBRICATION FITTINGS.</u> ADD GREASE TO FITTINGS(ON BOOM, HYDRAULIC CYLINDERS, MAIN FRAME, DRILL GUIDE, POWER DUMP AND SWING ASSEMBLY, AIR FEED MOTOR, CENTRALIZER, POWER GUIDE EXTENSION MOUNTING, PROPELLING CONTROLS, AND TRACK IDLERS). ADD GREASE TO FITTINGS ON HYDRAULIC PUMP (WEEKLY).	3
7	<u>HYDRAULIC RESERVOIR.</u> CHECK AND MAINTAIN OIL LEVEL 5 INCHES BELOW TOP OF RESERVOIR (WEEKLY).	3
8	<u>TRACTION UNIT.</u> LUBRICATE ROLLERS AND FITTINGS. CHECK OIL LEVEL IN FINAL DRIVE HOUSING.	3

lubricating Oil Reservoir

Disconnect the manifold lubricator air pipe plug on top of the manifold cover. Remove the pipe plug.

Insert a clean dipstick and check the level in the lubricating oil reservoir.

Fill with the prescribed oil as often as necessary.

Note: Do not allow the unit to run without oil in the reservoir. This oil furnishes the lubrication to the drifter drill and air motors, lack of lubrication will cause these parts to prematurey.

Normally, if the reservoir is filled at the beginning of the day, the drill should operate for several hours without refilling.

Lubricator Metering Valve Setting

Turn the metering valve handle (fig. 3-5) clockwise until completely closed.

Open the valve (counterclockwise rotation) six complete revolutions.

Start the drill. After several minutes, check to see that the following conditions exist:

Oil droplets are visible on the drill shank piece.

A bluish oil mist or haze is apparent in the exhaust.

If the above conditions do not exist, or if oil is flowing, readjust the valve as follows: (counterclockwise rotation allows oil to flow; clockwise rotation decreases flow of oil).

Note: Do not operate the drill with the metering valve closed. The oil furnishes the lubrication to the drifter drill and the air motors, and lack of lubrication will cause prematurey.

Oil is supplied from the propelling air motor through lubrication holes in the motor case cover. Thus, although there is no direct check of the oil level in the traction drive planetary gear housing, the level must be the same as that in the propelling air motor. Proceed as follows.

a. To check the oil level in the propelling air motors, remove the pipe plug located 1/3 of the way up from the bottom of the motor case (fig. 3-6). If oil flows from this port, the level is sufficient for both the propelling air motors and the traction drive.

b. If it is necessary to add oil, leave the pipe plug off and remove the vent cap at the top of the case. Add the prescribed lubricating oil through the vent cap port until it flows from the pipe plug port. Install the pipe plug and the vent cap.

c. When necessary to drain the oil from the traction drive planetary gear housing and propelling air motor, remove the magnetic plug and pipe plugs at the bottom of each housing and allow all of the oil to drain off. Clean and install the plugs and refill through the vent cap port (b above).

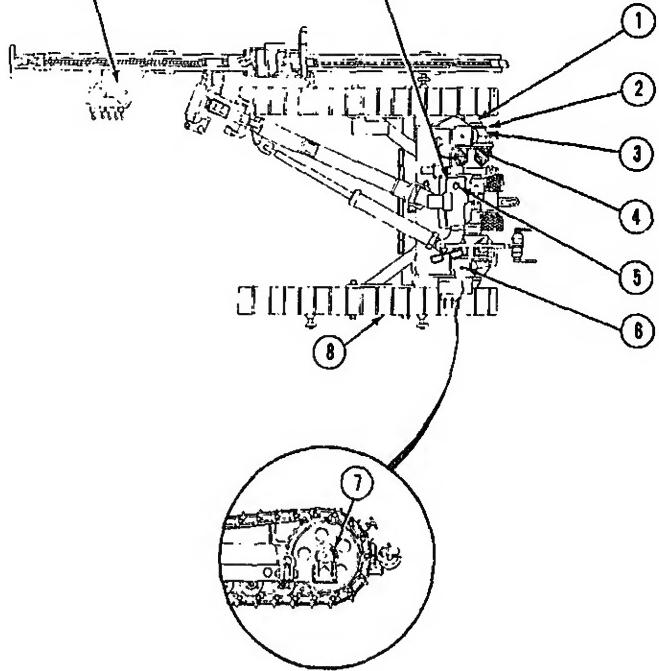
3-12. Checking Oil Level in Hydraulic Reservoir

a. Remove the vent cap from the hydraulic reservoir.

b. Insert a clean dipstick into the reservoir and check the level of oil. The level should be 5 inches below the top. This allows room for oil return during operation.

Note: If the unit is new or the system was drained, make sure oil is distributed throughout the closed system by turning on the hydraulic pump and operating the boom cylinders through use of the hydraulic valve. Recheck the oil level after operation, and refill if necessary.

c. Add the prescribed oil if necessary through the vent cap port, until the level is 5 inches below the top.



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM

1	<u>FINAL DRIVE</u> . DRAIN OIL AND REFILL (500 HOURS).
2	<u>MAGNETIC PLUGS</u> . CLEAN AND INSPECT (1000 HOURS).
3	<u>TRACTION DRIVE</u> . DRAIN OIL AND REFILL PLANET GEAR HOUSING(500 HOURS)
4	<u>PROPELLING AIR MOTORS</u> . DRAIN OIL AND REFILL (500 HOURS).
5	<u>HYDRAULIC RESERVOIR</u> . REMOVE AND CLEAN SUCTION OIL FILTER. DRAIN, FLUSH, AND REFILL RESERVOIR(1000 HOURS).
6	<u>BRAKES</u> . ADJUST BRAKES
7	<u>FINAL DRIVE SPROCKETS</u> . CHECK AND TIGHTEN SPROCKET STUD NUTS IF REQUIRED.
8	<u>TRACKS</u> . CHECK AND ADJUST TRACK IF REQUIRED.
9	<u>AIR FEED MOTOR</u> . DRAIN TRANSMISSION OIL IN WORM HOUSING. REFILL (500 HOURS).
10	<u>RETURN LINE OIL FILTER</u> . REPLACE FILTER CARTRIDGE (1000 HOURS).

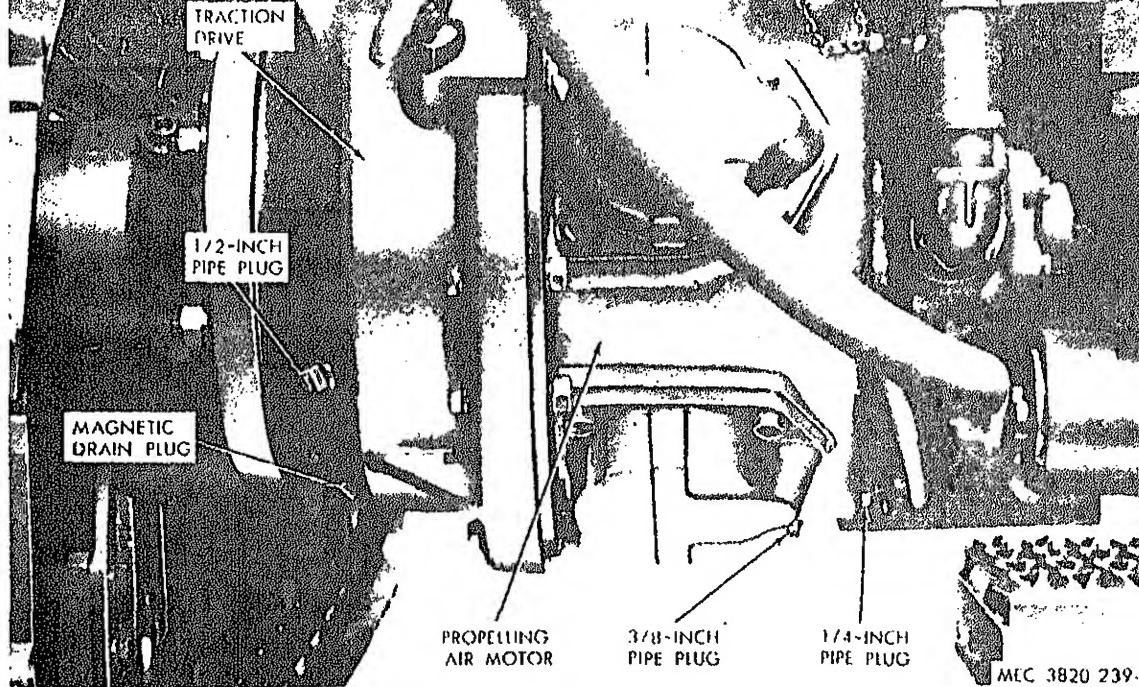


Figure 3-6. Lubrication of traction drive and propelling air motors.

Note. Since the hydraulic system is a closed system, there should never be need to add a significant amount of oil. Should frequent refilling be required, inspect carefully for leaks or defective seals and components. See figure 1-5 for a complete hydraulic piping diagram.

3-13. Lubricating Traction Unit

a. Clean the oil fittings on the track rollers, rear sprocket shaft, and front wheel support of each traction unit (fig. 3-7).

Note. If the pneumatic drill is standing or operating in mud or water, clean and oil the fittings every 4 hours instead of every 8 hours.

b. Using an oil gun, fill each fitting until oil is forced out through the seals.

c. To check the oil level in the final drive housing, remove the oil level plug near the bottom of each drive (on the inner side of the rear sprocket) (fig. 3-8).

d. If it is necessary to add oil, remove the filler plug at the top of the final drive (fig. 3-8). Add the prescribed oil until it flows from the oil level plug port. Inspect the oil level plug and the fill plug.

e. When necessary to drain the oil from the final drive housing, remove the magnetic drain plug from the bottom of each housing (fig. 3-8) and allow all of the oil to drain. Clean and install the drain and level plugs. Refill through the fill plug port (d). When refilling, note that the capacity of the final drive housing is 1 1/2 pints of oil.

3-14. Lubricating Air Feed Motor

a. Remove the worm housing plug from the top of the air feed motor (fig. 3-9) and

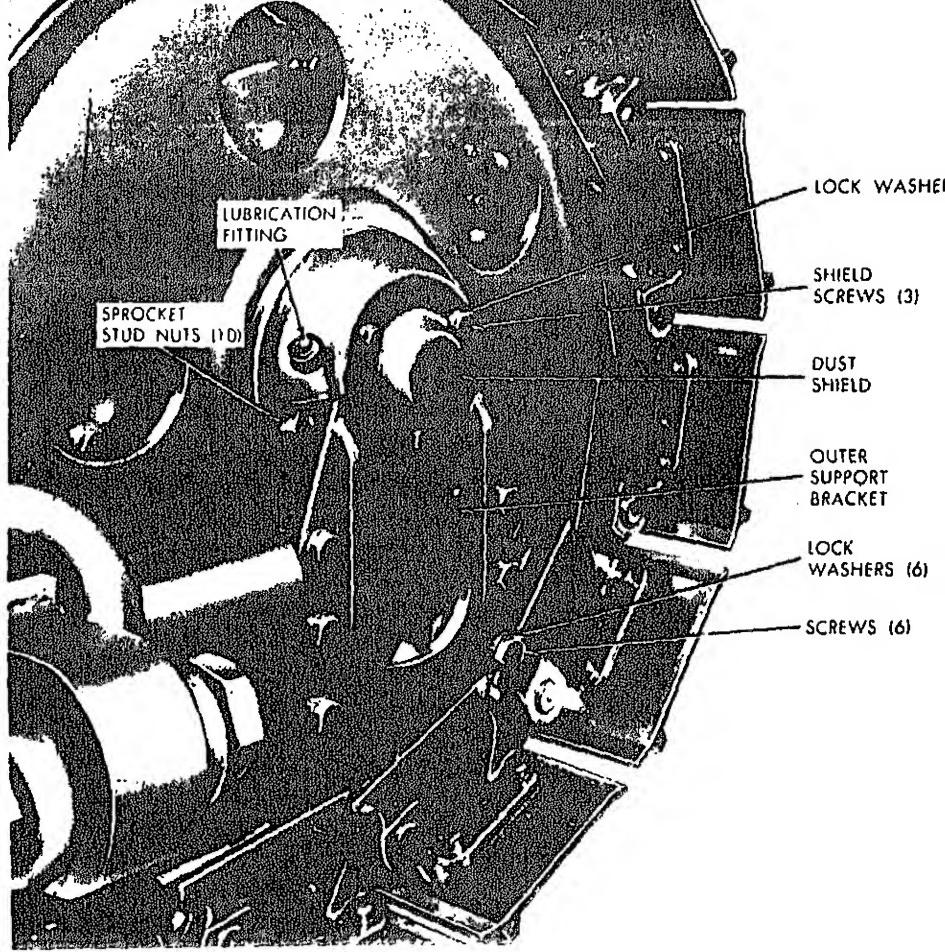


Figure 8-7(1). Lubrication of traction unit.

the prescribed lubricating oil to replenish the supply.

b. Remove the grease plug from the side of the air feed motor cylinder case and add 2 to 3 ounces of the prescribed grease.

c. When necessary to drain the oil from the air feed motor worm housing, position the

drill guide so that the air goes down, and remove the worm. The two pipe plugs from the bottom all of the oil to drain off. Position the drill guide in the worm and refill through the worm (a above).

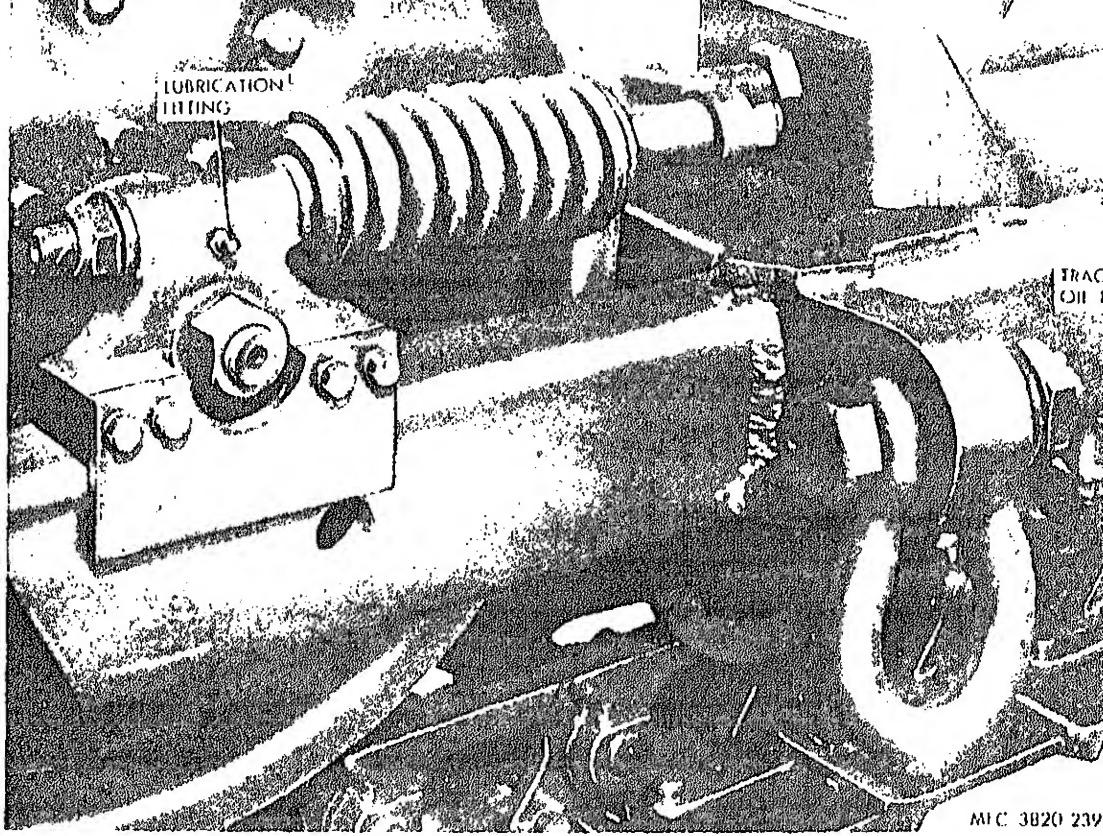


Figure 3-7(2)—Continued.

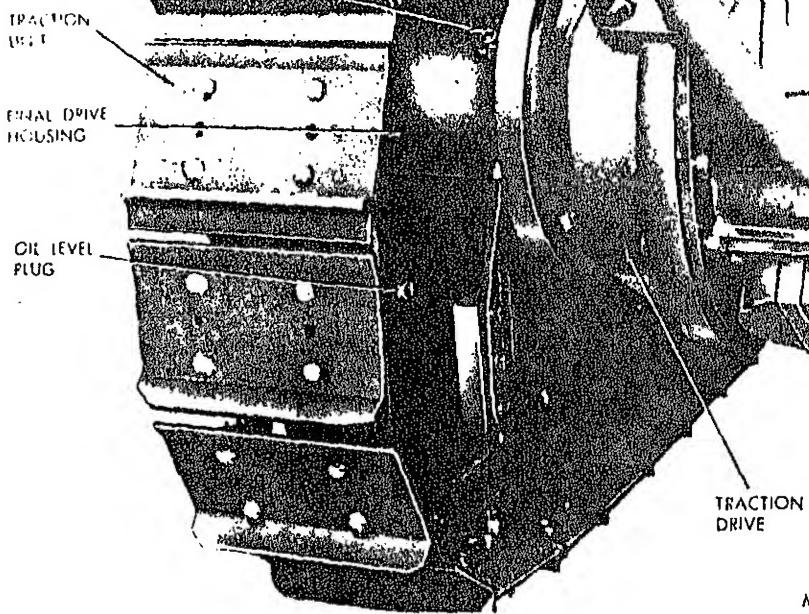


Figure 3-8. Lubrication of traction unit final drive housing.

MAGNETIC
PLUG

1/8-INCH
PIPE PLUGS

AIR FEED
MOTOR

GREASE
PLUG

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diagnosing and correcting unanticipated operation or failure of the pneumatic drill. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

3-16. No Hydraulic Pressure in System

Probable cause	Possible remedy
Insufficient air supply to hydraulic pump air motor.	Check hoses and fittings for leakage.
Throttle valve closed.	Open throttle valve.
Hydraulic pump coupling loose or damaged.	Inspect and tighten or replace.
Hydraulic pump or air motor damaged.	Replace pump or air motor (para. 8-48).
Hydraulic lines clogged.	Check suction filter and hydraulic reservoir for dirt and sludge. Drain, flush and refill if necessary (para. 8-28).
Hydraulic oil level low.	Check hydraulic reservoir (para. 8-12) and fill if necessary. Inspect for leaks.

3-17. Drifter Drill Inoperative

Probable cause	Possible remedy
Air feed motor connections loose or damaged.	Check hoses and fittings for leakage.
Air feed motor not being properly lubricated.	Check level in lubricating oil reservoir. Refill if required (para. 8-9).
Feed chain broken or damaged.	Inspect, clean, and lubricate feed chain (para. 8-27).
Air feed motor damaged.	Disassemble and inspect (report this condition to direct support maintenance).
Remote control manifold damaged.	Disassemble and inspect (report this condition to direct support maintenance).
Drifter drill binding or damaged.	Disassemble and inspect (report this condition to direct support maintenance).

3-18. Hydraulic Valve Operating Improperly

Probable cause	Possible remedy
Excessive leakage around boss fittings.	Tighten hoses. If loose and insp. shows damage, report this condition to direct support maintenance.
Fluttering action due to plugged return line.	Inspect return line. Replace carton if necessary. If necessary, flush hydraulic reservoir if necessary.
Levers do not operate smoothly.	Disassemble and inspect lever assembly for binding at spools, springs, and handles (report this condition to direct support maintenance).
Erratic system pressure.	Clean relief valve. If erratic pressure continues, replace hydraulic valve. Report this condition to direct support maintenance.

3-19. Boom Operates Improperly

Probable cause	Possible remedy
Oil leakage in hydraulic cylinders.	Replace cylinder seals (para. 8-46).
Excessive clearance between cylinder head and rod.	Replace rod packing. Report this condition to direct support maintenance.
Boom drifts due to cylinder leakage.	Replace cylinder seals (para. 8-46).

3-20. Traction Unit Brakes Inoperative

Probable cause	Possible remedy
Brakes need adjustment.	Adjust brakes (para. 8-88).
Air hoses to brakes improperly connected or damaged.	Inspect hoses for damage and proper connections (para. 8-11).
Brakes damaged.	Disassemble and inspect (report this condition to direct support maintenance).

raction Unit Operates Improperly

le cause
rs do not ro-

Possible remedy
Check for wedged objects
and lubricate rollers
(para. 8-18).

Improper lubrication ----- Check oil level in pro-
pelling air motors and
lubricating oil reservoir.
Lubricate fittings (para.
8-18).

Section VI. HYDRAULIC RESERVOIR

General

hydraulic reservoir stores and provides
hydraulic oil to operate the boom and guide
s, as a result of operation of the hy-
draulic valve. The reservoir is an integral part
of the boom base assembly.

Servicing Procedure

Move the vent cap from the top of the
reservoir.

Move the magnetic plug from the bottom
of the boom base assembly.
Allow the oil to drain off.

The reservoir holds 10 gallons of oil. Pro-
vide a suitable container to collect the runoff.

Move the suction oil filter (fig. 8-8),
with an approved solvent, and blow dry
with compressed air.

Install the suction oil filter with a new
vent cap gasket.

f. Clean the magnetic plug and install on
the drain adapter at the bottom of the hydraulic
reservoir.

g. Remove and discard the return line oil
filter cartridge (fig. 8-2). Clean the body and
other parts with an approved solvent and in-
stall a new filter cartridge.

h. Add the prescribed oil until the level is
within 5 inches of the top of the reservoir. In-
stall the vent cap.

i. Operate the booms with the hydraulic
valve to make sure oil is flowing throughout
the system.

j. Remove the vent cap and recheck the oil
level with a clean dipstick. Add oil if necessary
to bring the level up to within 5 inches of the
top.

***Caution:** Do not overfill. The reservoir
must allow for return of oil during opera-
tion.*

Section VII. FEED CHAIN

General

Feed chain passes over sprockets at each
end of the drill guide, and over idler wheels
and wing sprockets in the air feed motor.
Feed chain transmits power from the air
motor worm-gear to the drifter drill for
driving up and down the drill guide.

Adjustment

Check the adjustment of the feed chain by
pressing against the rollers at a point approxi-
mately midway up the drill guide (fig. 8-10).
If adjustment is proper, the chain will de-

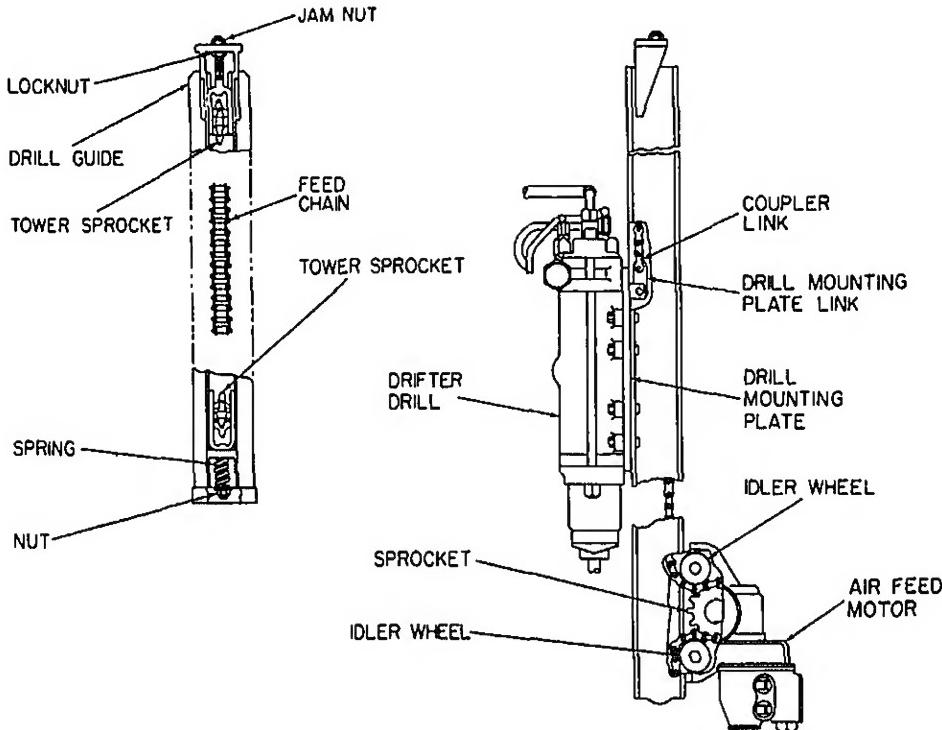
FEED CHAIN

Note. A new feed chain has a tendency to stretch
and should be checked frequently.

a. Back off the nut on the bottom of the
drill guide (fig. 8-10) until the spring is
loose.

b. Tighten the bottom nut until the spring
(fig. 8-10) just begins to compress (approxi-
mately 1/8 inch).

c. Loosen the jam nut on the top of the drill
guide (fig. 8-10) and adjust the locknut until
the feed chain tension is correct. Tighten the
jam nut.



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Figure 3-10. Adjustment and removal of feed chain.

b. Disconnect the feed chain coupler links (fig. 3-10) from the drill mounting plate links by removing the cotter pins and the link side plates.

c. Lift the feed chain off the tower sprockets and carefully remove it from the air feed motor sprocket and the drill guide.

-27. Cleaning and Inspection

a. Clean the feed chain with approved solvent. Dry thoroughly.

b. Inspect the feed chain carefully for broken links. Repair or replace as necessary.

c. Coat the feed chain with oil to prevent rusting during storage or the next use.

3-28. Installation

a. Loop the feed chain around the tower sprocket (fig. 3-10) on the drill gu-

b. Carefully thread the chain under the idler wheel, around the sprocket, and over bottom idler wheel in the air feed mo (fig. 3-10).

Caution: Make sure the feed chain enga properly with the sprocket to avoid binding

c. Thread the feed chain around the tower sprocket (fig. 3-10) and connect coupler links to the drill mounting plate lin Install the cotter pins in the coupler links bend the ends over to secure the side pla

d. Adjust feed chain tension (see par 3-25).

ighten the ends of the cotter pins
1) and remove the pins.

See figure 8-11 and install the centralizer.

Section IX. DRIFTER DRILL

General

Drifter drill is an air-operated drill lubricated by rock drill oil which is injected into the stream from the lubricating oil

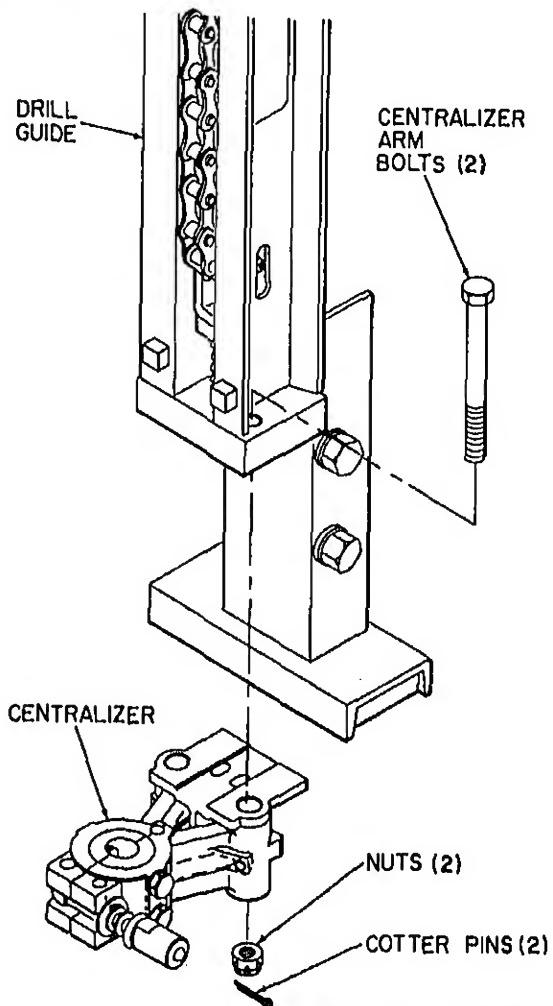
Removal

Disconnect the air hoses from the drifter

Loosen the drill mounting plate clamp nuts (fig. 8-12) and remove the drill from the drill guide.

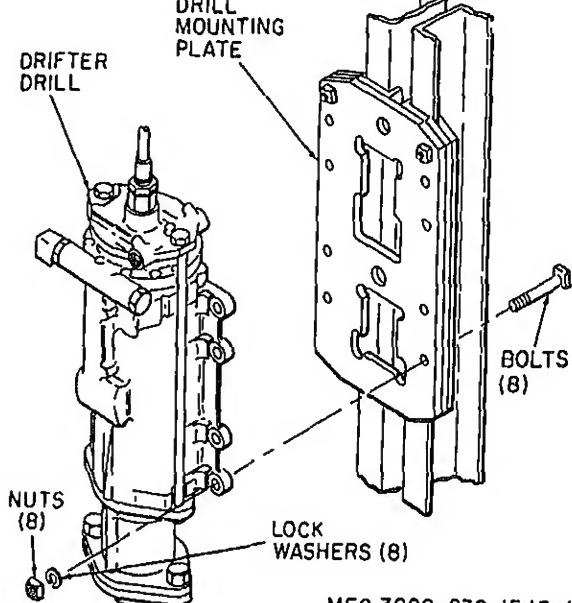
Installation

Refer to figure 8-12 and install the drifter drill on the drill mounting plate.



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Figure 8-11. Removal of centralizer.



MEC 3820-239-15/3-12

Figure 3-12. Removal of drifter drill.

Section X. TRACTION UNIT

3-35. General

The traction unit provides the propelling motion for the unit. The only work authorized at organizational level is the checking and adjustment of the tracks, and tightening sprocket stud nuts if required.

3-36. Servicing

a. Track Adjustment.

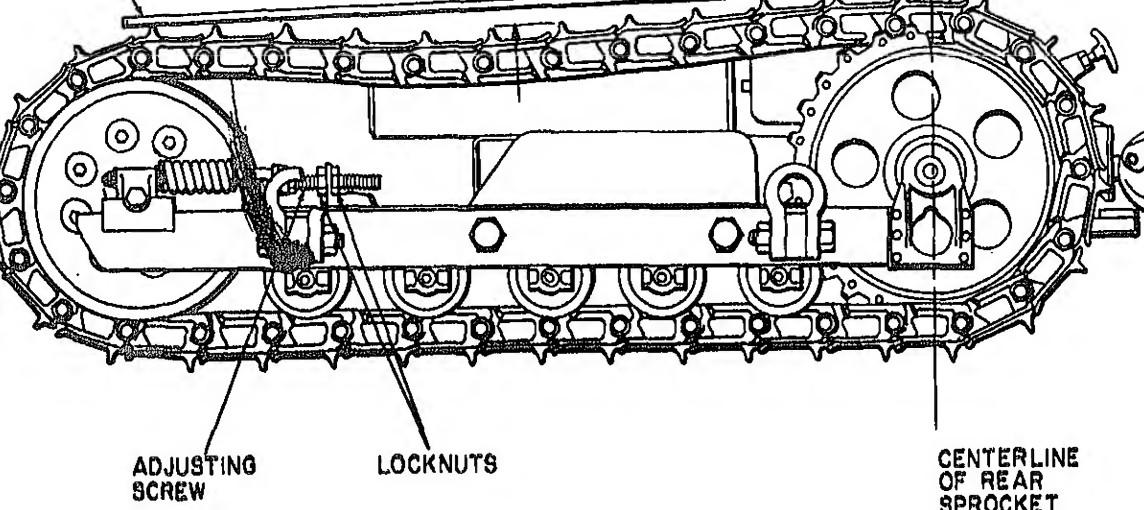
- (1) Propel the pneumatic drill until the center of a grouser is directly over the centerline of the rear wheel sprocket (fig. 3-13).
- (2) Lay a straightedge across the track so that it rests on the grousers over both the front and rear wheels.
- (3) Check the dip at the midpoint between wheels (fig. 3-13). The correct adjustment is 2 inches from the bottom of the rail to the centerline of the rear wheel sprocket.

(4) If the adjustment is not correct, the unit drifts to one side while tramping, adjust by loosening one of the adjustment locknuts and tightening the other using the track adjustment lever. When the adjustment is correct, tighten the locknut.

b. Sprocket Stud Nuts.

Note. When the unit is new, it is essential that the sprocket stud nuts be checked for tightness after approximately 100 hours of use. After the initial check, annual rechecks are recommended.

- (1) Remove the dust shield and support bracket (fig. 3-14) from the traction unit rear sprocket.
- (2) Using a torque wrench, tighten the 10 sprocket stud nuts to a torque of 150 feet-pound.



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Figure 3-19. Track adjustment.

Section XI. AUTOMATIC BRAKES

3-37. General

The automatic brakes used on the pneumatic drill operate independently of each other. Each brake is designed to be normally on, thus preventing accidental movement. When the propelling controls are used, some of the air to the propelling air motors is directed to the brake (fig. 1-3), thus releasing it. During towing, the brake can be manually released by turning in (clockwise) the setscrew at the top of each brake housing.

3-38. Brake Adjustment

There is no method of checking the brake adjustment without actually making the adjustment. Unless a trouble is encountered during operation which pinpoints the brakes as the trouble source, perform the adjustment only

when specified during preventive maintenance services.

a. Remove the screws, nuts, and lock washers holding the brake cylinder cover (fig. 3-14).

b. Lift off the brake cylinder cover and brake cylinder gasket.

c. Screw two 5/8-inch coarse thread bolts into the holes in the top of the brake piston and remove the piston from the cylinder.

Caution: Be careful not to damage the brake piston O-ring.

d. Using a 1 1/4-inch socket wrench, tighten the brake bolt until the working length of the brake spring (measured from the bottom of the cylinder to the top of the brake spring) is 1/2 inches (fig. 3-14).

e. See figure 3-14 and install the part

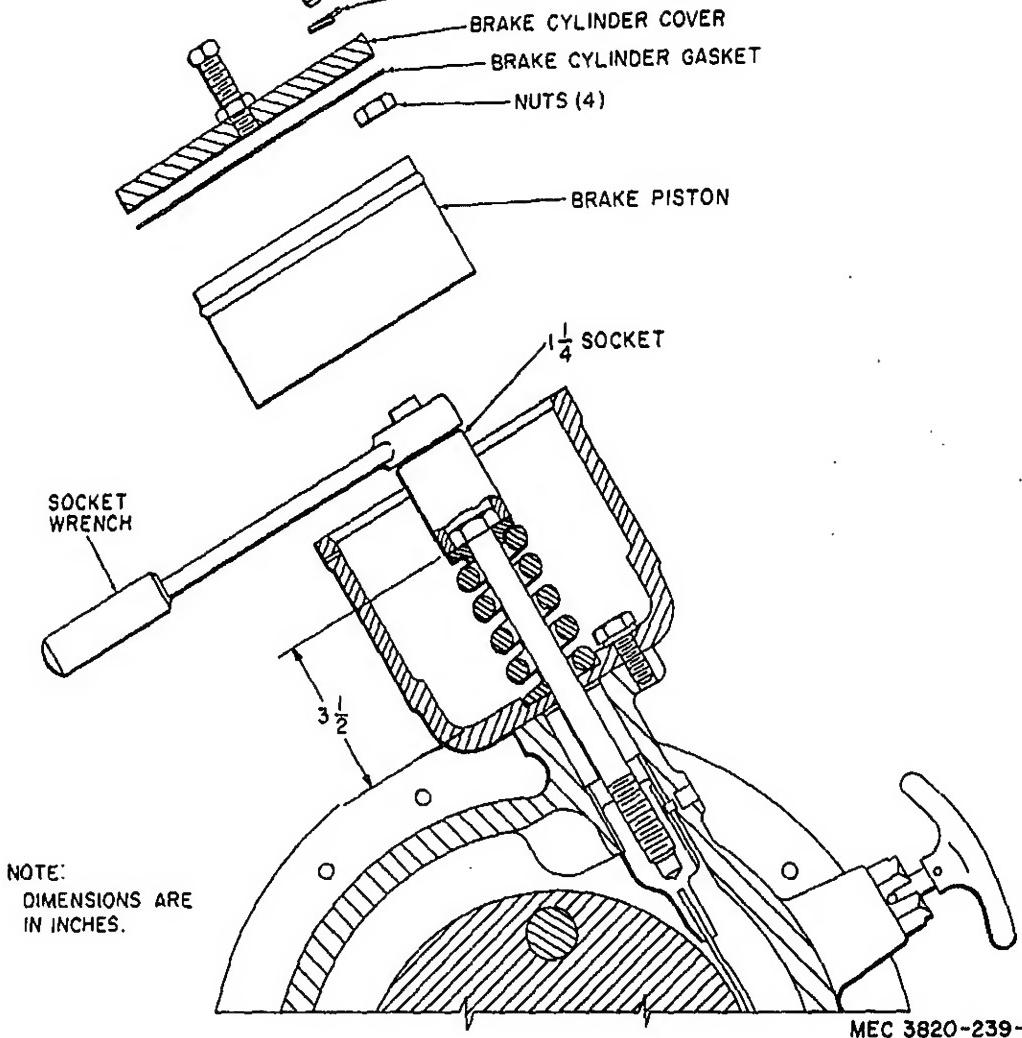


Figure 3-14. Brake adjustment.

Section XII. TOW HITCH

3-39. General

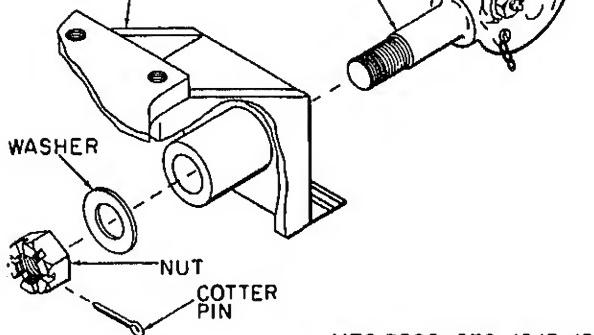
The tow hitch is a swivel-type hitch mounted at the rear of the frame (fig. 1-2). It may be used to couple the compressor to the unit, or to connect to a truck or tractor when towing.

3-40. Removal

- b. Remove the nut and washer at the tow hitch.

3-41. Installation

See figure 3-15 and install the



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Figure 3-15. Removal of tow hitch.

Section XIII. HYDRAULIC PUMP ASSEMBLY

42. General

The complete hydraulic pump assembly consists of a hydraulic pump air motor, a flexible coupling, and a hydraulic pump. The air motor drives the pump and furnishes all hydraulic power to the hydraulic valve for operation of the hydraulic cylinders (fig. 1-5).

43. Removal

- Disconnect all hoses and fittings.
- Remove the four nuts, lock washers, and studs (fig. 3-16) and separate the complete hydraulic pump assembly from the boom base.

Note. If necessary to replace only the air motor, flexible coupling, or hydraulic pump, follow the required procedures given below.

- Loosen the setscrew on either side of the flexible coupling, depending on which unit is to be removed.

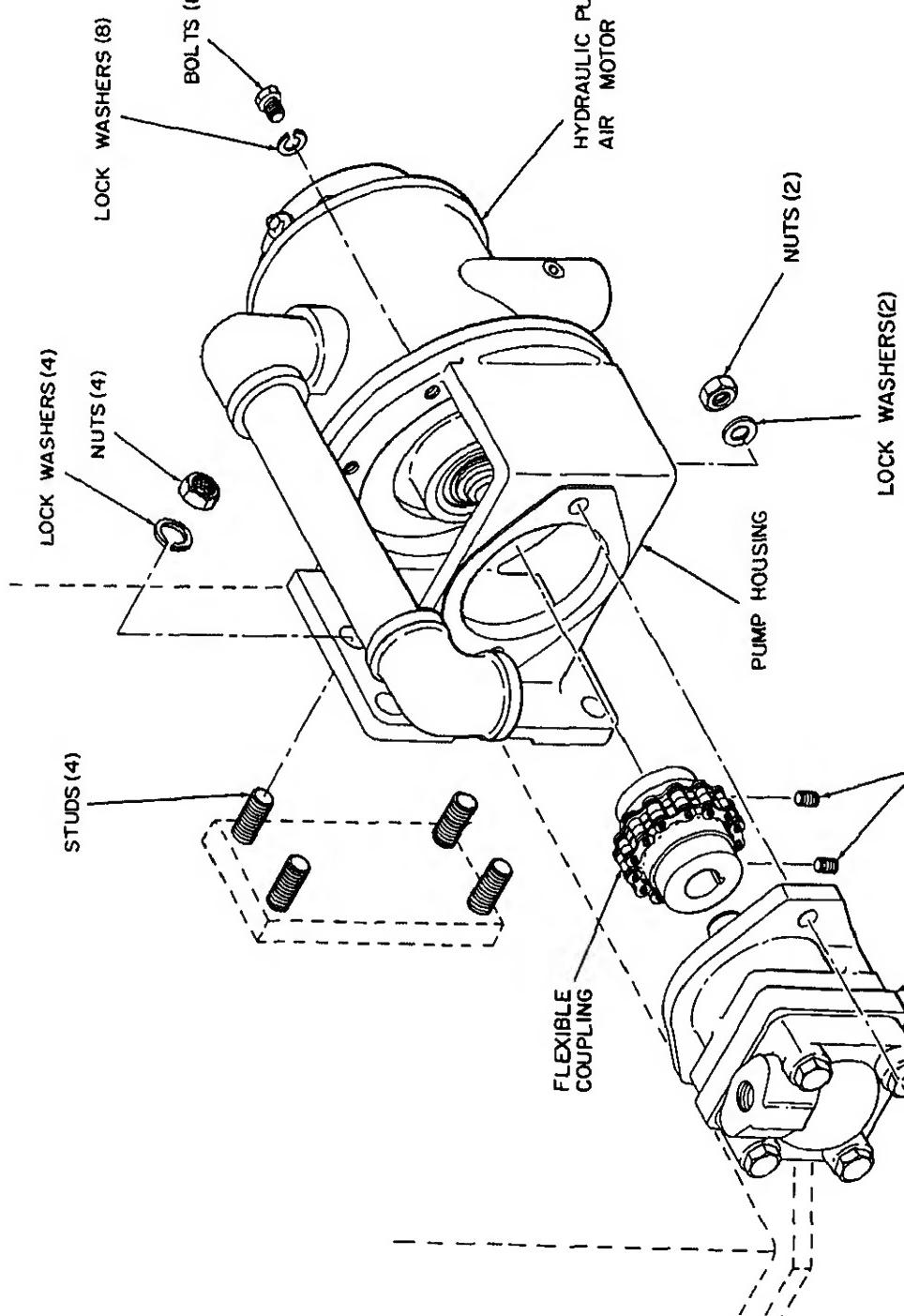
d. Remove the two nuts, lock washers, bolts securing the hydraulic pump to the pump housing (fig. 3-16), and remove the hydraulic pump with or without the flexible coupling.

e. Remove the eight bolts and lock washers securing the hydraulic pump air motor to the pump housing (fig. 3-16), and remove the motor.

f. Loosen the remaining setscrew on the flexible coupling and separate the flexible coupling from the shaft.

3-44. Installation

- See figure 3-16 and install the hydraulic pump parts.
- See figure 1-5 and connect the hoses and fittings.



The hydraulic cylinders used on the pneumatic drill are all essentially identical in operation and design. The two cylinders used on the hydraulic boom assembly (boom swing and boom lift) (fig. 1-1) control the boom position horizontally and vertically. The two cylinders used on the power dump and swing assembly (swing and dump) (fig. 1-1) control the position of the drill guide. The remaining cylinder is a part of the power guide extension mounting (fig. 1-1). The extension cylinder raises the drill guide up and down within the supports of the extension mounting.

6. Removal

General. See figure 1-5 and disconnect

moved.

b. Hydraulic Boom Cylinders. See figure 3-17 and remove the boom swing cylinder and the boom lift cylinder.

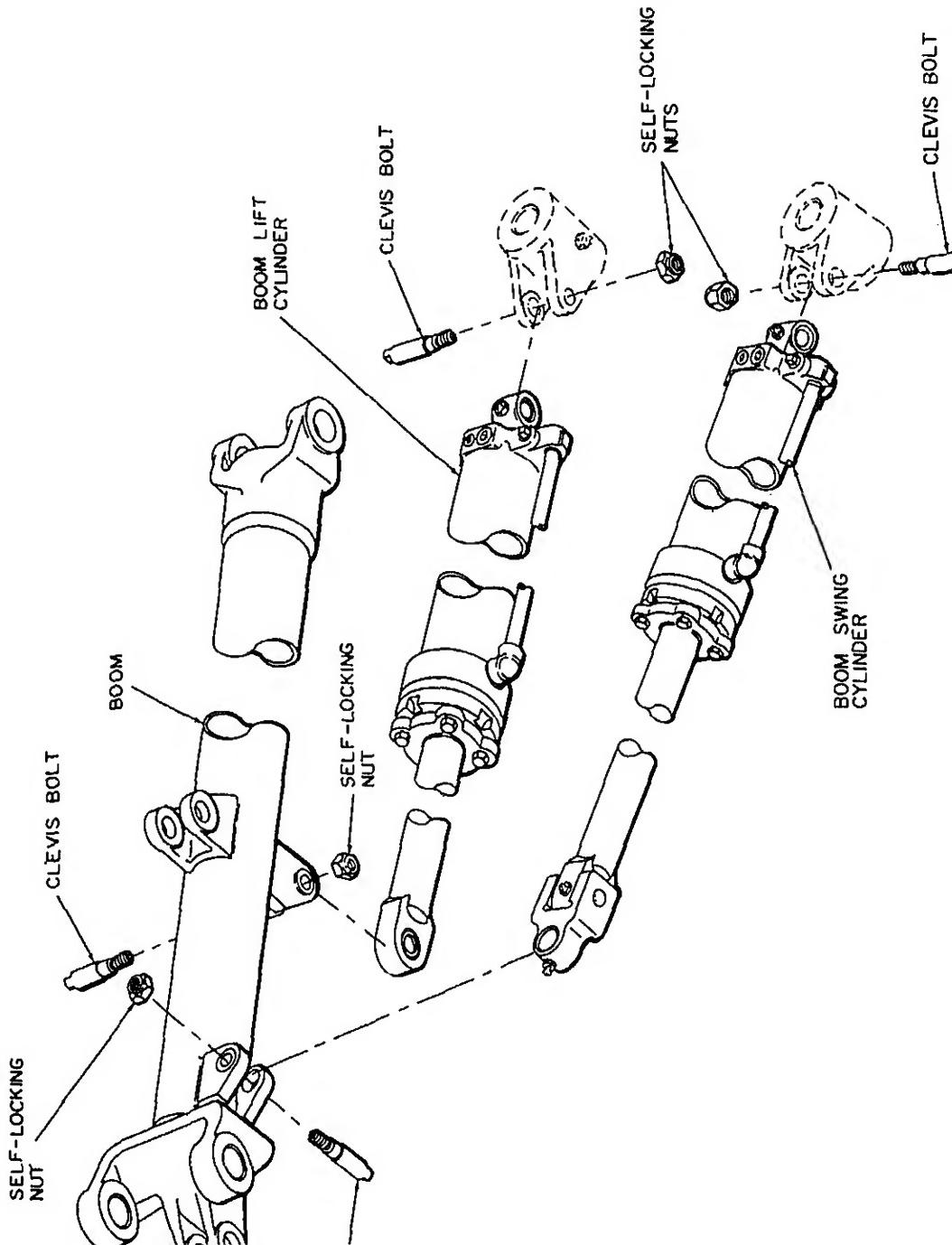
c. Power Dump and Swing Cylinder. See figure 3-18 and remove the dump cylinder and the swing cylinder from the power dump and swing assembly.

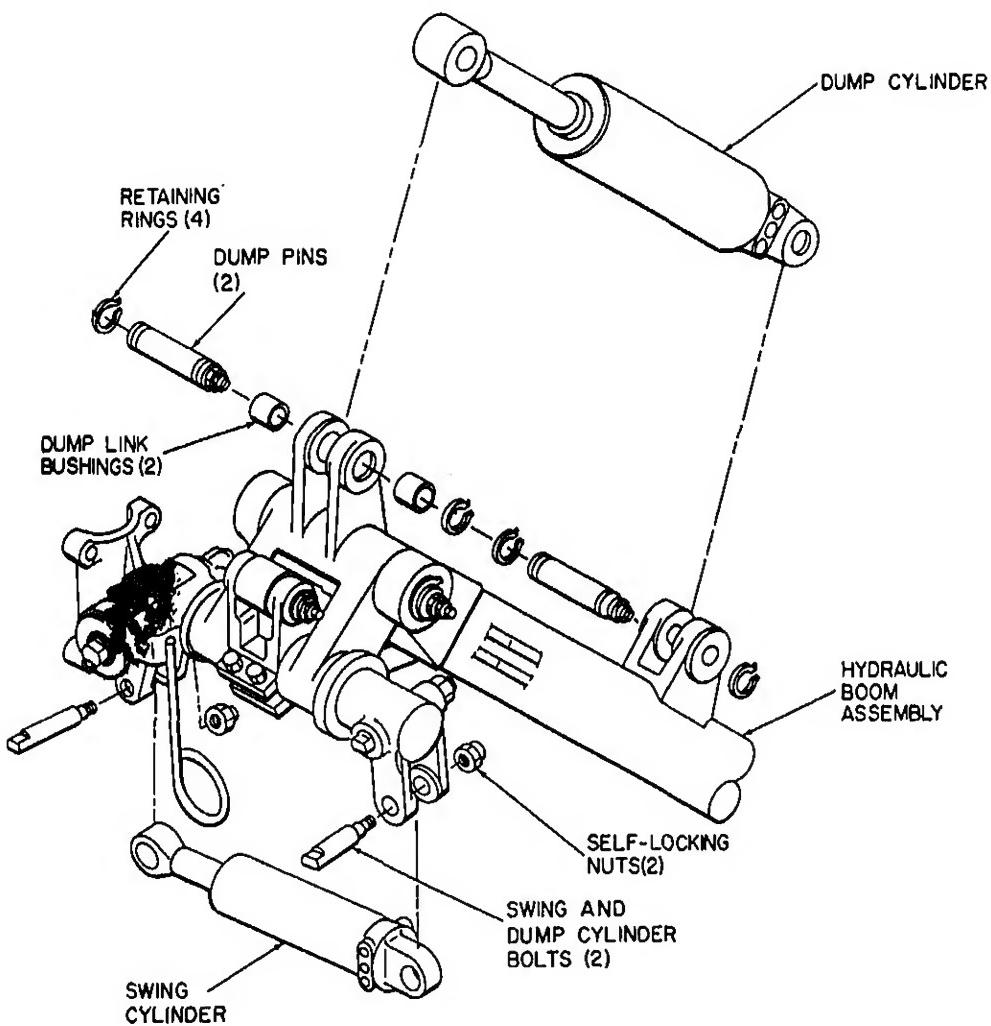
d. Drill Guide Extension Cylinder. See figure 3-19 and remove the drill guide extension cylinder.

3-47. Installation

a. See figures 3-17 through 3-19 and the hydraulic cylinders.

b. See figure 1-5 and connect the hose fittings.





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Figure 3-18. Removal of power dump and swing cylinders.

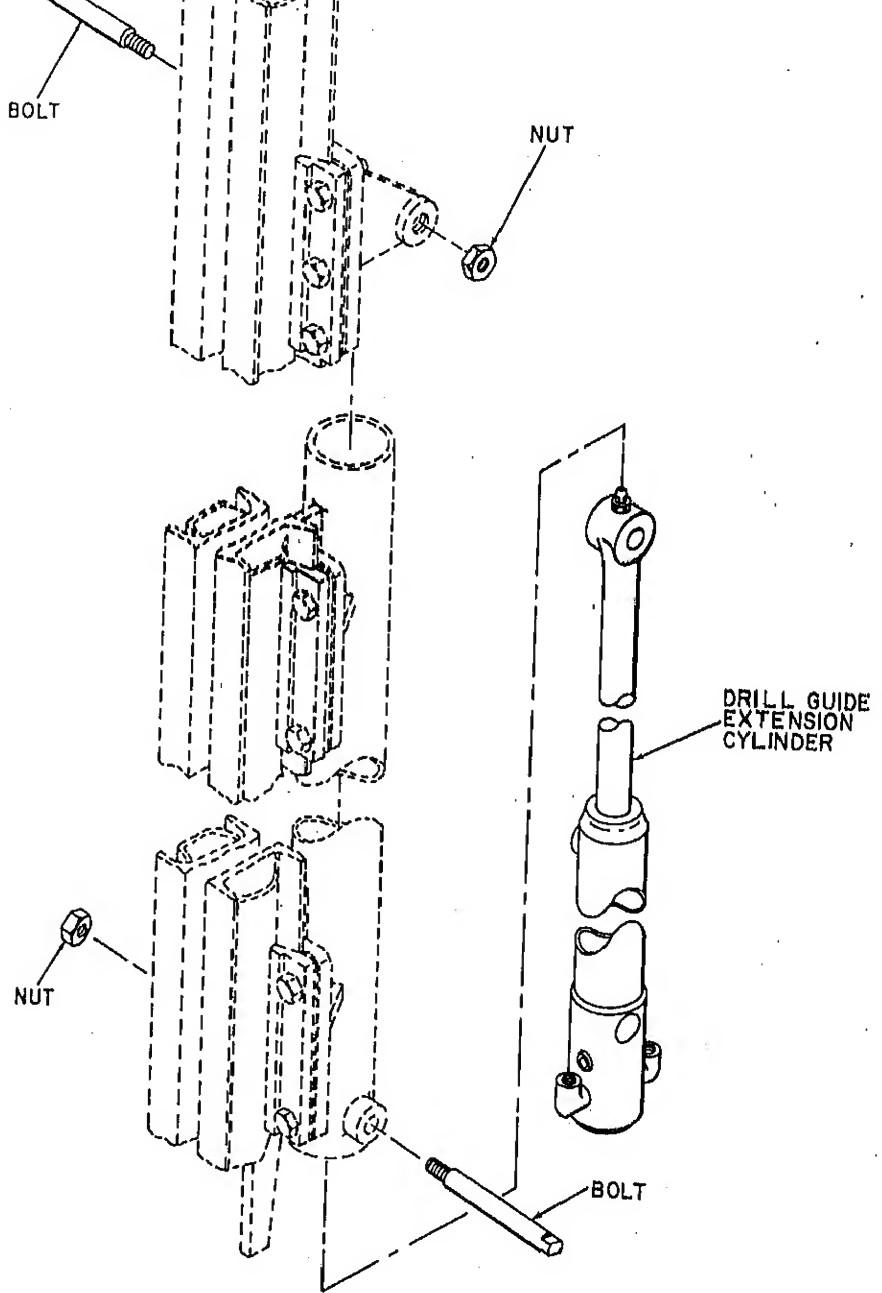


Figure 3-19. Removal of drill guide extension cylinder.

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Section XV. MAIN AIR VALVE AND

tering valve on the lubricator.

49. Removal

- a. See figure 1-3 and disconnect all hoses and fittings.

Section XVI. AIR FEED MOTOR

51. General

The air feed motor (fig. 1-1) provides the power to feed the drill and move it up and down the drill guide.

52. Removal

- a. See figure 1-4 and disconnect the hoses and fittings.
- b. Refer to paragraph 8-26 and remove the feed chain.

3-50. Installation

- a. See figure 8-20 and install the main valve and the manifold lubricator.
- b. See figure 1-3 and connect all hoses and fittings.

Note. The feed chain must be removed before the air feed motor can be removed.

- c. See figure 3-21 and remove the air motor.

3-53. Installation

- a. See figure 8-21 and install the air motor.
- b. Refer to paragraph 8-28 and install the feed chain.
- c. See figure 1-4 and connect the hoses and fittings.

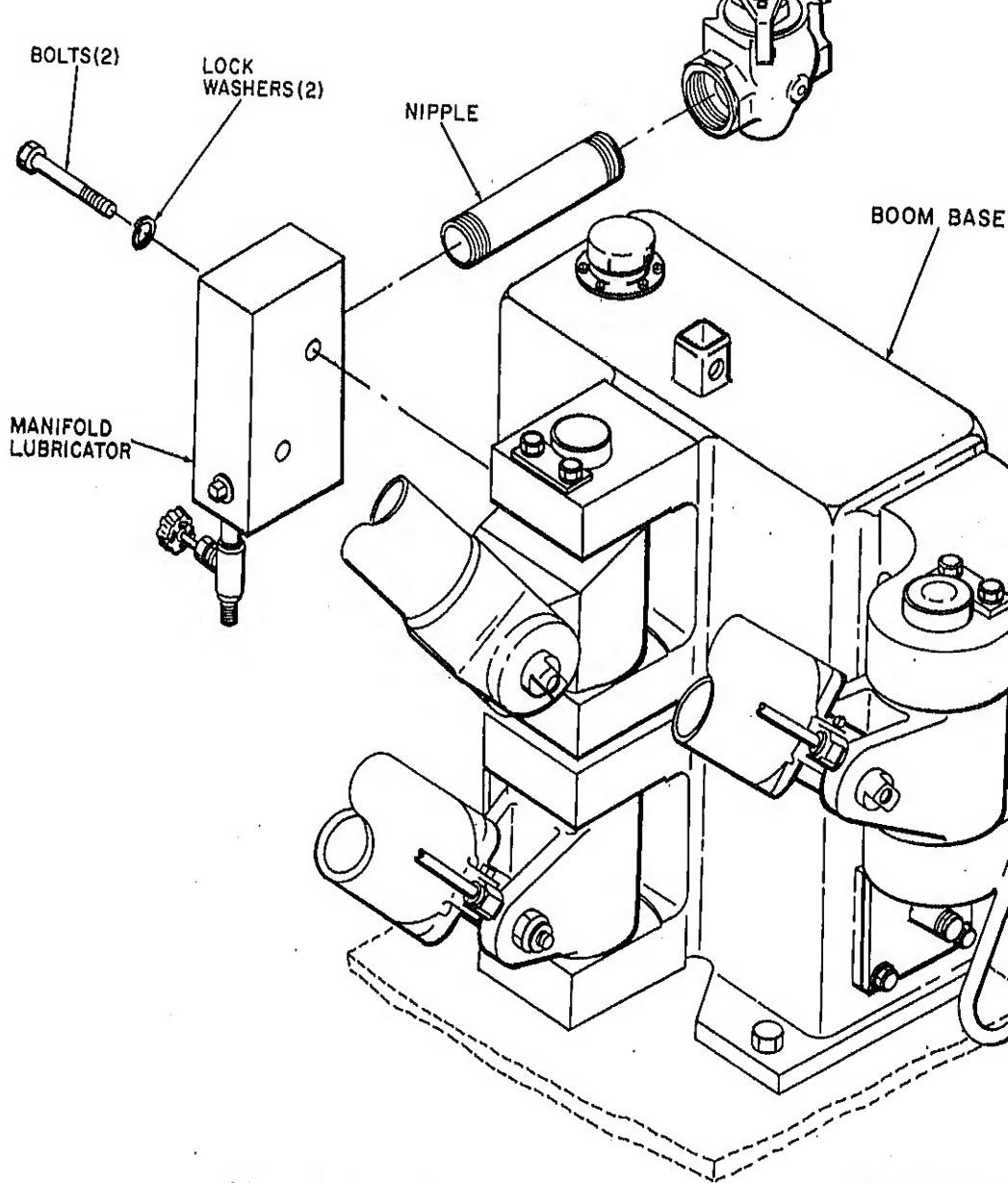


Figure 3-20. Removal of main air valve and manifold lubricator.

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Section XVII. REMOTE CONTROL MANIFOLD

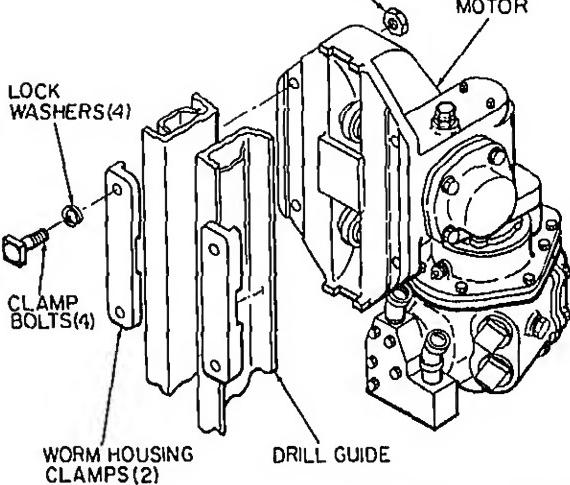
figure 1-4 and disconnect hoses and

figure 3-22 and remove the remote manifold.

Installation

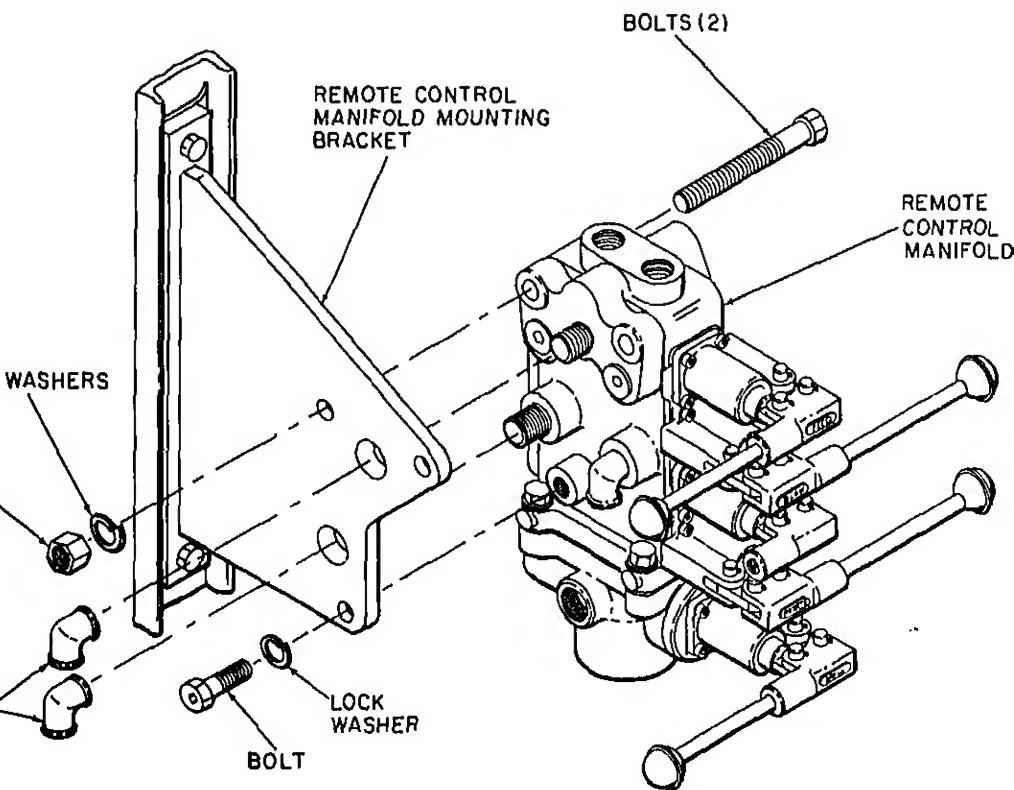
figure 3-22 and install the remote manifold.

figure 1-4 and connect the hoses and



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Figure 3-21. Removal of air feed motor.



consists of five valves which control hydraulic oil flow to each of the five hydraulic cylinders. Twelve lines are connected to the unit; inlet and return lines for each cylinder, plus a main inlet from the hydraulic pump and a return line to the hydraulic reservoir (fig. 1-5).

3-58. Removal

- a. See figure 1-5 and disconnect all hoses and fittings.

Note. Label each line to facilitate proper installation.

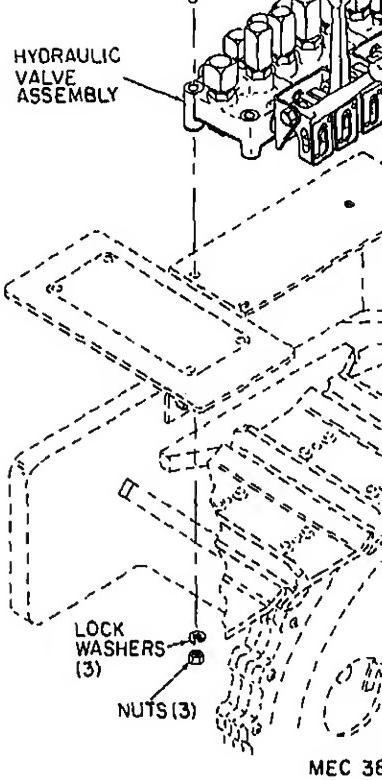
- b. See figure 3-23 and remove the hydraulic valve assembly from the mounting bracket.

3-59. Installation

- a. See figure 3-23 and install the hydraulic valve assembly.

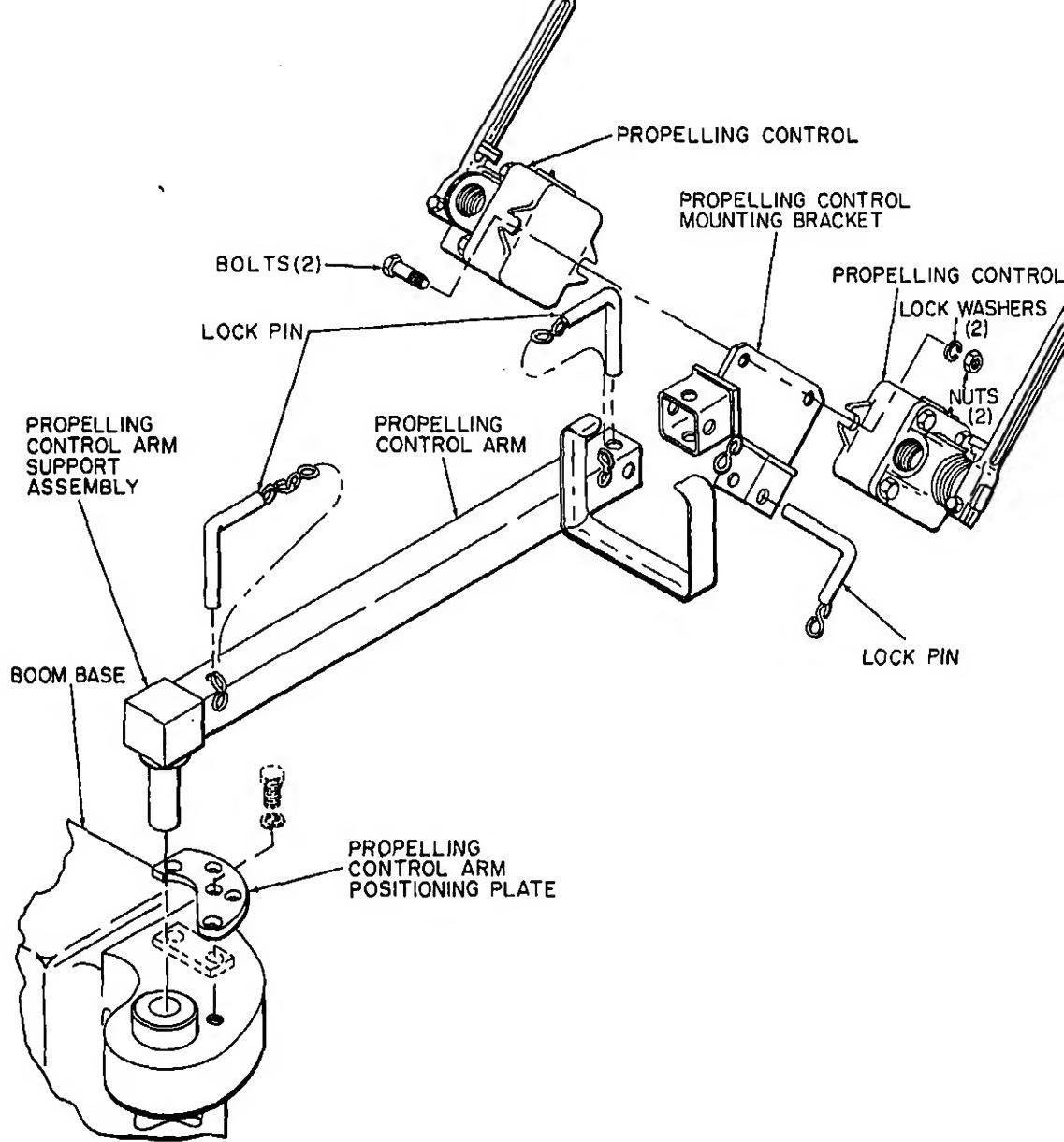
- b. See figure 1-5 and connect hoses and fittings.

Caution: Be sure hoses are properly connected.



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Figure 3-23. Removal of hydraulic



The propelling controls (fig. 1-2) control the flow of air to the propelling air motors for each track. Each control consists of a three-position valve, which can be moved either forward or back, to direct the flow of air one way or the other, causing the propelling air motor to move the track forward or reverse (fig. 1-3). The control is spring-loaded to the center (off) position, and each valve can be operated independently of the other.

a. See figure 1-3 and fittings.

b. See figure 3-24 and fittings.

3-62. Installation

a. See figure 3-24 and controls.

b. See figure 1-3 and fittings.

CHAPTER 4

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

1. Scope

These instructions are published for the use direct and general support and depot maintenance personnel maintaining the Ingersoll and model CM150A/D475A pneumatic drill. They provide information on the maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

4-2. Record and Report Forms

For the record and report forms applicable to direct and general support and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicles Operator's Identification Card) which is carried by operator, shall be kept in a canvas bag mounted on equipment.

Section II. DESCRIPTION AND TABULATED DATA

3. Description

For a complete description of the pneumatic drill see paragraph 1-8.

4. Tabulated Data

a. General. This paragraph contains the overhaul data pertinent to direct and general support and depot maintenance personnel.

b. Traction Units.

Manufacturer Oliver Corp
Model OT-176770-AS
Number of rollers 5
Width of grousers 10 in.

c. Hydraulic Pump.

Flow rating 1.5 gpm (gallons per minute)
Input pressure 2000 psi
Torque of cover screws 22 to 28 ft-lb

Torque of bolt 12 to 15 ft-lb

e. Propelling Air Motors.

Power rating 11.4 hp (horse power)
Number of cylinders 5

f. Hydraulic Valve.

Manufacturer Aico
Model 1042CM150
Pressure setting 2000 psi (pounds per square inch)

g. Torque Data. Refer to paragraph 1(20) for a complete list of all hardware used and the corresponding torque values.

h. Air Piping Diagram. For propelling piping diagram see figure 1-3. For drill piping diagram see figure 1-4.

i. Hydraulic Piping Diagram. For hydraulic piping diagram see figure 1-5.

Chuck nut flutes	--	--	--	--
Piston to cylinder clearance	--	--	0.000	0.009
Piston to piston stem bearing clearance	--	--	0.000	0.009
Rifle bar flutes	--	--	--	--
Rifle nut flutes	--	--	--	--
Shank to shank aliner clearance	--	--	--	--
Valve to valve chest clearance	--	--	0.000	0.008

TRACTION DRIVES:

Drive shaft OD	2.163	2.165	0.0002T	0.0024L
Drive shaft, stub OD	1.1803	1.1808	0.0001T	0.0008L
Drive shaft, pinion bore OD	2.0462	2.0472	0.0010T	0.0005L
Drive shaft ball bearing ID	2.1648	2.1654	0.0002T	0.0024L
Drive shaft ball bearing OD	3.0364	3.0370	0.0010T	0.0016L
Gear housing, bore OD	8.986	8.988	0.0010T	0.0016L
Motor pinion ball bearing ID	0.9830	0.9848	0.0010T	0.0001T
Motor pinion ball bearing OD	2.0467	2.0472	0.0010T	0.0005L
Motor pinion gear OD	0.9844	0.9849	0.0010T	0.0001T
Planet gear ID	2.8322	2.8334	0.0024T	0.0007T
Planet gear ball bearing ID	1.1807	1.1811	0.0001T	0.0008L
Planet gear ball bearing OD	2.8341	2.8346	0.0024T	0.0007T

AIR FEED MOTOR:

Bearing stud OD	0.9835	0.9840	0.0001L	0.008L
Connecting rod bushing wall thickness	0.053	0.107	--	--
Crank pinion bearing ID	0.5906	0.5909	0.0003L	0.0009L
Crank pinion bearing OD	1.6535	1.6540	0.0002T	0.0013L
Crank pinion, small OD	0.5900	0.5903	0.0003L	0.0009L
Crank pinion, large OD	0.6270	0.6275	0.0025T	0.0015T
Cylinder case, lower crank bearing bore ID	2.0475	2.0485	0.0002L	0.0014L
Cylinder case, upper crank bearing bore ID	1.8508	1.8518	0.0001T	0.0014L
Cylinder liner ID	1.7505	1.7530	--	--
Drive gear, bearing bore ID	2.0475	2.0485	0.0002L	0.0014L
Gear case, crank bearing bore ID	1.6538	1.6548	0.0002T	0.0018L
Gear case, inner worm bearing bore ID	2.4405	2.4413	0.0015T	0.0007L
Idler wheel bushing ID	1.0030	1.0040	0.0030L	0.0045L
Idler wheel shaft OD	0.9995	1.0000	0.0030L	0.0045L
Inner worm bearing ID	1.1805	1.1810	0.0015T	0.0005T
Inner worm bearing OD	2.4410	2.4420	0.0015T	0.0007L
Inner worm wheel bearing ID	1.2600	1.2605	0.0015T	0.0005T
Inner worm wheel bearing OD	2.8345	2.8355	0.0007T	0.0015L
Lower crank bearing ID	0.9841	0.9843	0.0004T	0.0003L
Lower crank bearing OD	2.0471	2.0473	0.0002L	0.0014L
Lower throw crank, bearing OD	0.9840	0.9845	0.0004T	0.0003L
Lower throw crank, pinion ID	0.6250	0.6255	0.0025T	0.0015T
Outer worm bearing ID	0.9835	0.9840	0.0015T	0.0005T
Outer worm bearing OD	2.4410	2.4420	0.0015T	0.0003L
Outer worm wheel bearing ID	1.1805	1.1810	0.0015T	0.0005T
Outer worm wheel bearing OD	2.4410	2.4420	0.0007T	0.0015L
Piston wrist pin OD	0.3762	0.3765	0.0003L	0.0013L
Piston wrist pin bore ID	2.0500	2.0515	0.0015T	0.0005T

Component	Minimum	Maximum	Minimum	Maximum
Rotary valve, shaft OD	1.1210	1.1240	--	--
Sprocket, shaft bore ID	1.2500	1.2505	0.0015T	0.0005T
Sprocket shaft, gear surfaces OD	1.2510	1.2515	0.0015T	0.0005T
Sprocket shaft, inner bearing OD	1.2610	1.2615	0.0015T	0.0005T
Sprocket shaft, outer bearing OD	1.1815	1.1820	0.0015T	0.0005T
Thrust bearing ID	0.9841	0.9843	0.0001L	0.0008L
Thrust bearing OD	2.0471	2.0473	0.0002L	0.0014L
Upper crank bearing ID	0.7874	0.7878	0.0006T	0.0003L
Upper crank bearing OD	1.8504	1.8509	0.0001T	0.0014L
Upper throw crank, bearing OD	0.7875	0.7880	0.0006T	0.0003L
Worm, shaft bore ID	1.0000	1.0005	0.0005T	0.0005L
Worm housing, inner worm wheel bearing bore ID	2.8348	2.8360	0.0007T	0.0015L
Worm housing, outer worm bearing bore ID	2.4405	2.4413	0.0015T	0.0003L
Worm housing cap, bearing bore ID	2.4413	2.4425	0.0007T	0.0015L
Worm shaft, inner bearing OD	1.1815	1.1820	0.0015T	0.0005T
Worm shaft, outer bearing OD	0.9845	0.9850	0.0015T	0.0005T
Worm shaft, worm surface OD	1.0003	1.0008	0.0005T	0.0005L
Worm wheel, bore ID	1.2495	1.2505	0.0020T	0.0005T
DRAULIC PUMP AIR MOTOR:				
Front ball bearing ID	0.9843	0.9847	0.0002T	0.0005T
Front ball bearing OD	2.4409	2.4414	0.0010T	0.0001L
Front end plate, bore ID	2.4404	2.4410	0.0010T	0.0001L
Rear ball bearing ID	0.7874	0.7878	0.0002T	0.0005L
Rear ball bearing OD	2.0472	2.0477	0.0012T	0.0002T
Rear end plate, bore ID	2.0465	2.0470	0.0012T	0.0002T
Rotor, small shaft OD	0.7873	0.7876	0.0002T	0.0005L
Rotor, large shaft OD	0.9842	0.9845	0.0002T	0.0005L
OPPELLING AIR MOTORS:				
Motor case, bearing bore ID	3.1497	3.1507	0.0004T	0.0011L
Pin end crank, bearing OD	1.5750	1.5755	0.0007T	0.0003L
Pin end crank ball bearing ID	1.5748	1.5753	0.0007T	0.0003L
Valve end crank, bearing OD	1.5750	1.5755	0.0007T	0.0003L
Valve end crank ball bearing ID	1.5748	1.5753	0.0007T	0.0003L
Valve end crank ball bearing OD	8.1496	8.1501	0.0004T	0.0011L
ACTION UNITS:				
Bearing retainer bore ID	2.4395	2.4405	0.0025T	0.0005T
Complete inner bearing ID	1.3750	1.3755	0.0015T	0.0005T
Complete inner bearing OD	2.7170	2.7180	0.0025T	0.0005T
Complete inner ring gear bearing ID	2.0000	2.0005	0.0001T	0.0009L
Complete inner ring gear bearing OD	3.5000	3.5010	0.003T	0.001LT
Complete outer bearing ID	1.1250	1.1255	0.0020T	0.0010T
Complete outer bearing OD	2.4410	2.4420	0.0025T	0.0005T
Complete outer ring gear bearing ID	1.6250	1.6255	0.0000T	0.0010L
Complete outer ring gear bearing OD	3.1250	3.1260	0.003T	0.001T

Component	Minimum	Maximum	Minimum	Maximum
Ring gear and hub assembly, inner bearing ID	3.498	3.499	0.003T	0.001T
Ring gear and hub assembly, outer bearing OD	3.128	3.124	0.003T	0.001T
Shaft and spacer housing, inner bearing bore ID	2.7165	2.7165	0.0025T	0.0005T
Shaft and spacer housing, inner ring gear bearing OD	1.9996	2.0001	0.0001T	0.0009L
Shaft and spacer housing, outer ring gear bearing OD	1.6245	1.6250	0.0000T	0.0010L
Track idler bushing retainer ID	1.498	1.499	0.004L	0.008L
Track idler bushing retainer OD	2.876	2.878	0.005T	0.001T
Track idler hub ID	2.873	2.875	0.005T	0.001T
Track idler shaft, bushing OD	1.491	1.492	0.004L	0.008L
Track idler shaft, support OD	1.1250	1.1255	0.0005L	0.0030L
Track idler support, shaft ID	1.126	1.128	0.0005L	0.0030L
Track roller bushing ID	1.4940	1.4975	0.0270L	0.0405L
Track roller bushing retainer OD	2.876	2.879	0.006T	0.001T
Track roller shaft OD	1.457	1.467	0.0270L	0.0405L

T denotes tight (interference) fit.

L denotes loose (clearance) fit.

CHAPTER 5

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

SPECIAL Tools and Equipment

No special tools or equipment is required for maintenance on the pneumatic

5-2. Specially Designed Tools and Equipment

No specially designed tools or equipment is required for performing maintenance on the pneumatic drill.

Section II. TROUBLESHOOTING

Trouble

tion provides information useful in and correcting unsatisfactory operation of the pneumatic drill or any components. Each trouble symptom followed by a list of probable causes. Possible remedy recommended is descriptive of the probable cause.

Drill Inoperative

Cause

Possible remedy

ng to drill ---- Inspect hoses, fittings, remote control manifold and air feed motor (fig. 1-4).

clogged ----- Disassemble and clean drill parts in approved solvent. Blow scale and dirt from lines before connecting (para 6-3).

brication ----- Adjust manifold lubricator. Check that oil vapor is observed in exhaust.

worn parts ---- Disassemble and inspect drill for damaged parts. Clean and lubricate

5-5. Drifter Drill Operates Sluggishly or Erratically

Probable cause

Dirt or foreign material clogging hoses.

Dirt clogging drill -----

Dieseling (ignition of air and oil in cylinder) which causes scoring and damage to parts.

Compressor supplying insufficient air.

Improper lubrication -----

Possible remedy

Check hoses and fittings for damage and restrictions. Clean and replace as necessary.

Disassemble and inspect drill parts. Clean and lubricate (para 6-3).

Check for possible over-lubrication or running air cushion. Reset manifold lubricator metering valve. Keep drill feed proper and avoid running drill into and out of hole at full throttle.

Check compressor and main air line. Make sure main air valve is fully open.

Readjust manifold lubricator if required. Check oil level in lubricating oil reservoir. Check piston and cylinder for heat checks. Replace

.....	parts before assembling (para 6-3).	position c 6-17).
Improper lubrication	Readjust manifold lubricator if required. Check oil level in lubricating oil reservoir.

5-7. Air Feed Motor Operates with Low Power

Probable cause	Possible remedy
Worn bearings	Disassemble and inspect all bearings (para 6-10c). Replace if required.
Pistons and cylinder liners worn or scored.	Disassemble and inspect for worn and scored parts (para 6-10c). Replace if required.
Rotary valve loose in rotary valve bushing.	Inspect and replace rotary valve if required.

5-8. Hydraulic Pump Operating Improperly

Probable cause	Possible remedy
Air supply insufficient	Check hoses and fittings for leakage.
Hydraulic oil flow restricted.	Check suction oil filter, return line oil filter and reservoir for dirt and clogging (fig. 1-5).
Flexible coupling loose	Disassemble and inspect for loose or damaged parts (para 6-17).
Improper lubrication	Check oil level in lubricating oil reservoir or adjust metering valve if required.

Section III. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS AND AUXILIARY ITEMS

5-11. General

a. Removal of major components not covered in this section are provided in Chapter 3. The remainder of the assemblies are covered in Chapter 6.

b. See figures 1-3 through 1-5 for piping

Probable cause	Possible
Excessive leakage	Check hoses Check con O-rings i
Control level linkage parts damaged.	Disassembl parts for 6-24).
Relief valve clogged causing erratic pressure.	Disassembl relief val 6-24). Ch thickness 2000 psi relief.
Hydraulic oil flow re- stricted.	Check sucu return lin and all h tings for ging (fig

5-10. Hydraulic Cylinders Operating Improperly

Probable cause	Possible
Excessive oil leakage at gland nut.	Disassembl cylinder packings required 6-59, and
Oil leakage at check valves at cylinders.	Disassembl for dama Replace r (paras. 6- 66).

5-12. Complete Drill Mounting

a. Removal.

- (1) Disconnect the manifold air line connection to the drill mounting (fig. 1-1).
- (2) Remove the 14 bolts

tive clamps to facilitate installation.
Installation.

- (1) See figure 5-1 and install the complete drill mounting (7). Make sure that the clamp shims (6) are installed in the same manner as removed.
- (2) Connect the air piping from the manifold lubricator.

3. Power Guide Extension Mounting

Removal.

- (1) Disconnect the hydraulic lines from the drill guide extension cylinder (fig. 1-5).
- (2) Remove the four swivel cap bolts (1, fig. 5-2), nuts (2), and lock washers (3), and separate the two guide mounting swivel caps (4) from the guide mounting swivel of the power dump and swing assembly (6), freeing the power guide extension mounting (5).

Installation.

- (1) See figure 5-2 and install the power guide extension mounting on the power dump and swing assembly.
- (2) Connect the hydraulic lines to the drill guide extension cylinder (see fig. 1-5).

3. Power Dump and Swing Assembly

Removal.

- (1) Disconnect the hydraulic lines from the dump and swing cylinders (fig. 1-5).
- (2) Remove the two retaining rings (1, fig. 5-3) and dump pin (2) securing the dump cylinder of power dump and swing assembly (5) to hydraulic boom assembly (6).
- (3) Remove the two retaining rings (1) and dump pin (2) securing the dump

assembly (6).

- (5) Remove the complete power dump and swing assembly (5).

b. Installation.

- (1) See figure 5-3 and install the power dump and swing assembly to the hydraulic boom assembly.
- (2) Connect the hydraulic lines to the dump and swing cylinders (fig. 1-5).

5-15. Hydraulic Boom Assembly

a. Removal.

- (1) Disconnect the hydraulic lines from the boom swing and boom lift cylinders (fig. 1-5).
- (2) Remove the screws (1 and 2, fig. 5-4) and lock washers (3) securing king pin locking plates (4) to boom base assembly (6).
- (3) Using a suitable hoist to support the weight of hydraulic boom assembly (5), remove the cylinder pedestal king pins of the hydraulic boom assembly from the mounting bracket of the boom base assembly.

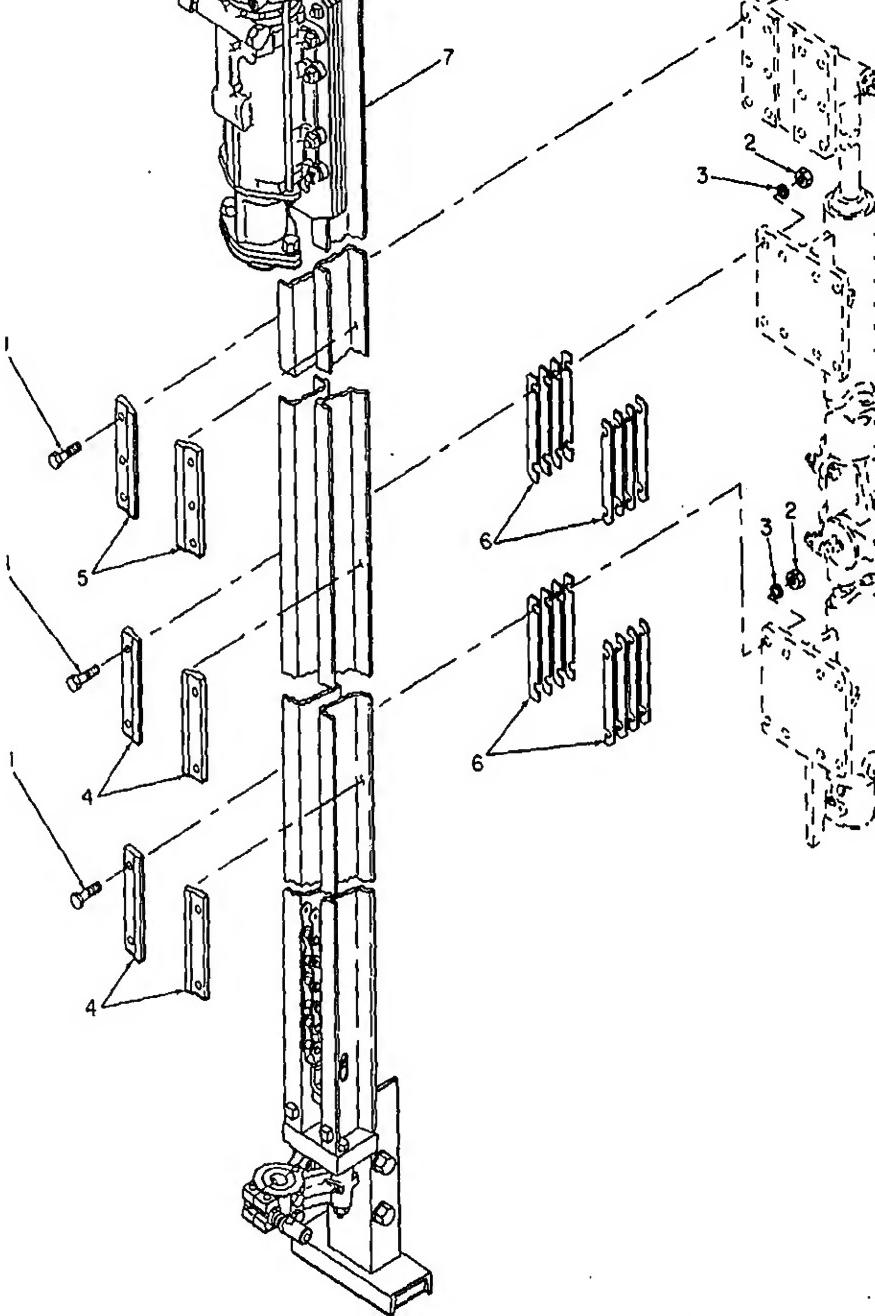
b. Installation.

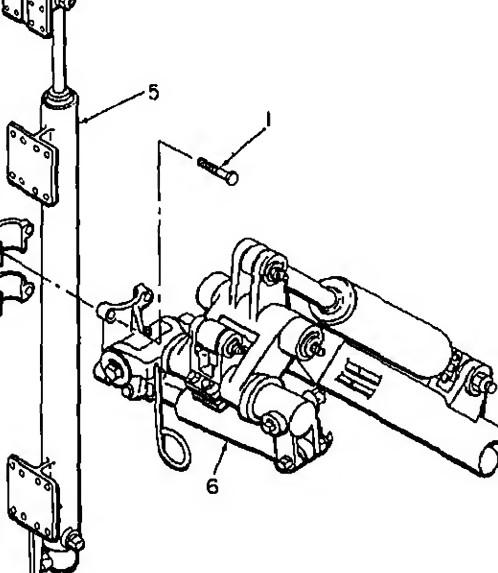
- (1) See figure 5-4 and install the hydraulic boom assembly.
- (2) Connect the hydraulic lines to the boom swing and boom lift cylinders (fig. 1-5).

5-16. Boom Base Assembly

a. Removal.

Note. Although the boom base assembly is secured to the frame only by five sets of hardware, removal is very time consuming because of the fact that both the hydraulic pump assembly and the manifold lubricator assembly are mounted to this base. This paragraph is written under the assumption that both of these assemblies have already been removed as described in Chapter 3.





MEC 3820-239-15/5-2

side mounting swivel cap bolt, 7/8-9 x 5 in.

(4)
t, hex, 7/8-9 (4)

asher, lock, 7/8 in. (4)

ide mounting swivel cap (2)

ower guide extension mounting

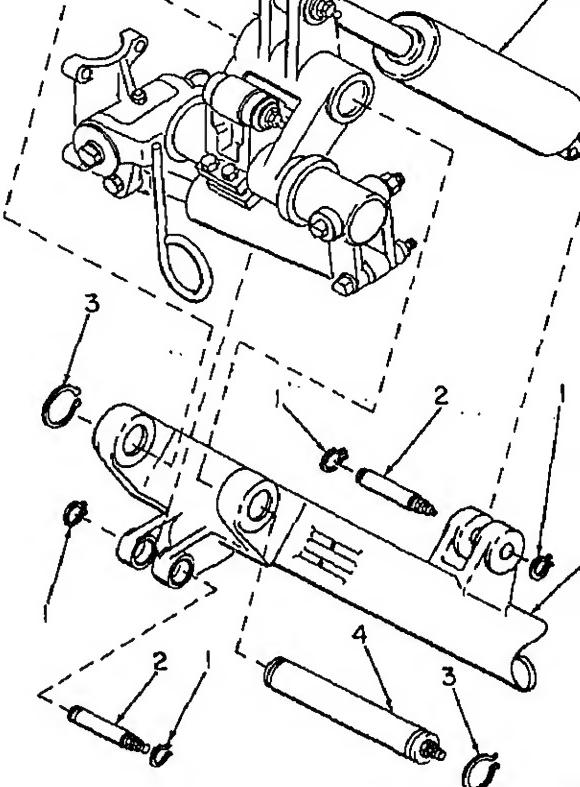
ower dump and swing assembly

Figure 5-2. Removal and installation of power guide extension mounting.

drain adapter under the main frame, and remove magnetic plug (2) and gasket (3), allowing the hydraulic reservoir to empty.

2) Disconnect the hydraulic fittings at the suction oil filter and the return line oil filter (fig. 1-5).

3) Remove the two screws (4, fig. 5-5) and lock washers (7) from the tapped holes in the main frame (9), and remove the three screws (5), nuts (6), and lock washers (7) from the remaining three holes in the boom base assembly (8) and main frame.



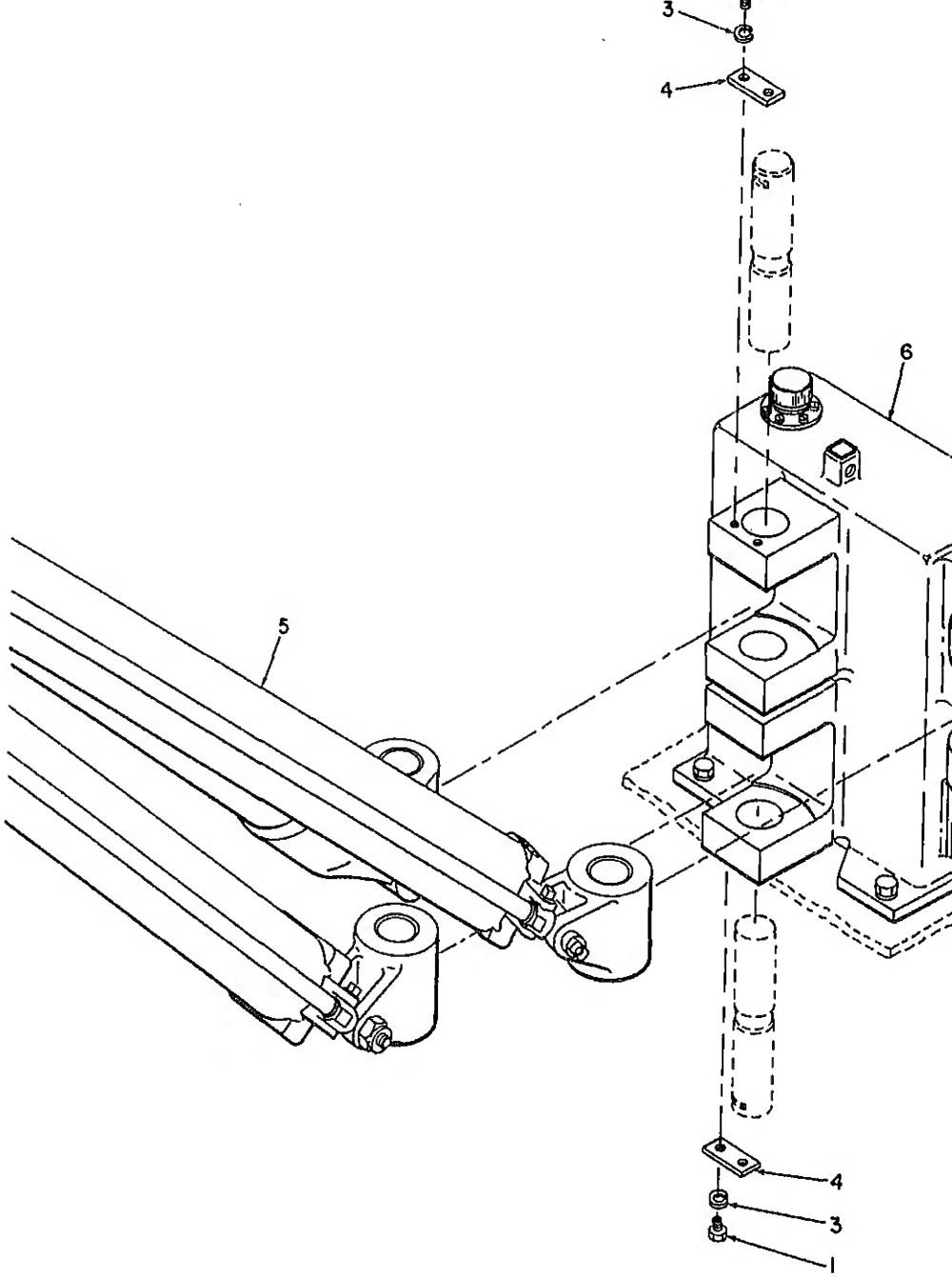
MEC 3820-239-15

- 1 Retaining ring (4)
- 2 Dump pin (2)
- 3 Retaining ring (2)
- 4 Dump pivot pin
- 5 Power dump and swing assembly
- 6 Hydraulic boom assembly

Figure 5-3. Removal and installation of power dump and swing assembly.

4) Using a suitable hoist, carefully lift the boom base assembly (8) from the main frame (9), being careful not to damage the protruding hydraulic drain adapter.

Note. If may be desirable to remove the hydraulic drain adapter, nipple and elbow from the bottom of the boom assembly before attempting to lift the assembly.



b. Installation.

Note. Before installing the boom base assembly, clean and flush the hydraulic reservoir, clean the suction oil filter and magnetic plug, and replace the return line oil filter as described in Chapter 3, Section IV.

- (1) See figure 5-5 and install the boom base assembly.
- (2) See figure 1-5 and make all hydraulic connections required.

5-17. Complete Traction Drive

a. Removal.

Note. The procedure for both complete traction drives is identical. Only the orientation is different. The following procedure and illustrations cover only the left (roadside) traction drive.

- (1) Disconnect the air piping fittings at the traction drive, propelling air motor, and brake (fig. 1-3).
- (2) Remove the six nuts (1, fig. 5-6), and lock washers (2) from the housing flange of traction unit (6).
- (3) Slide complete traction drive (4), with studs (3) attached, out of the traction unit housing and the mounting holes in the main frame.

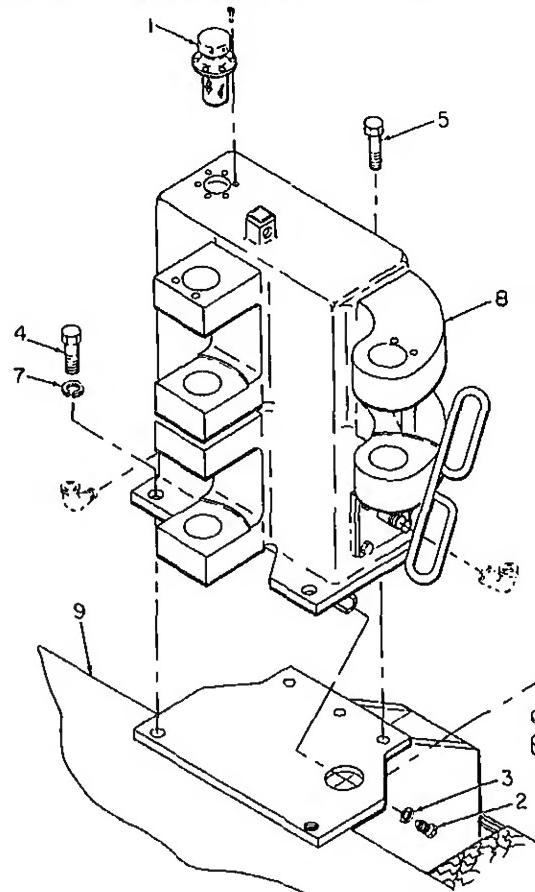
b. Installation.

- (1) See figure 5-6 and install the complete traction drive.
- (2) See figure 1-3 and make all air piping connections required.

5-18. Auxiliary Items

a. General. The auxiliary items for the pneumatic drill consist of the tool box, the tools provided in the box, drill shank pieces, and instruction and identification plates.

b. Removal. Normally removal is required only if parts are damaged. The only items requiring removal are the tool box and instruction and identification plates.

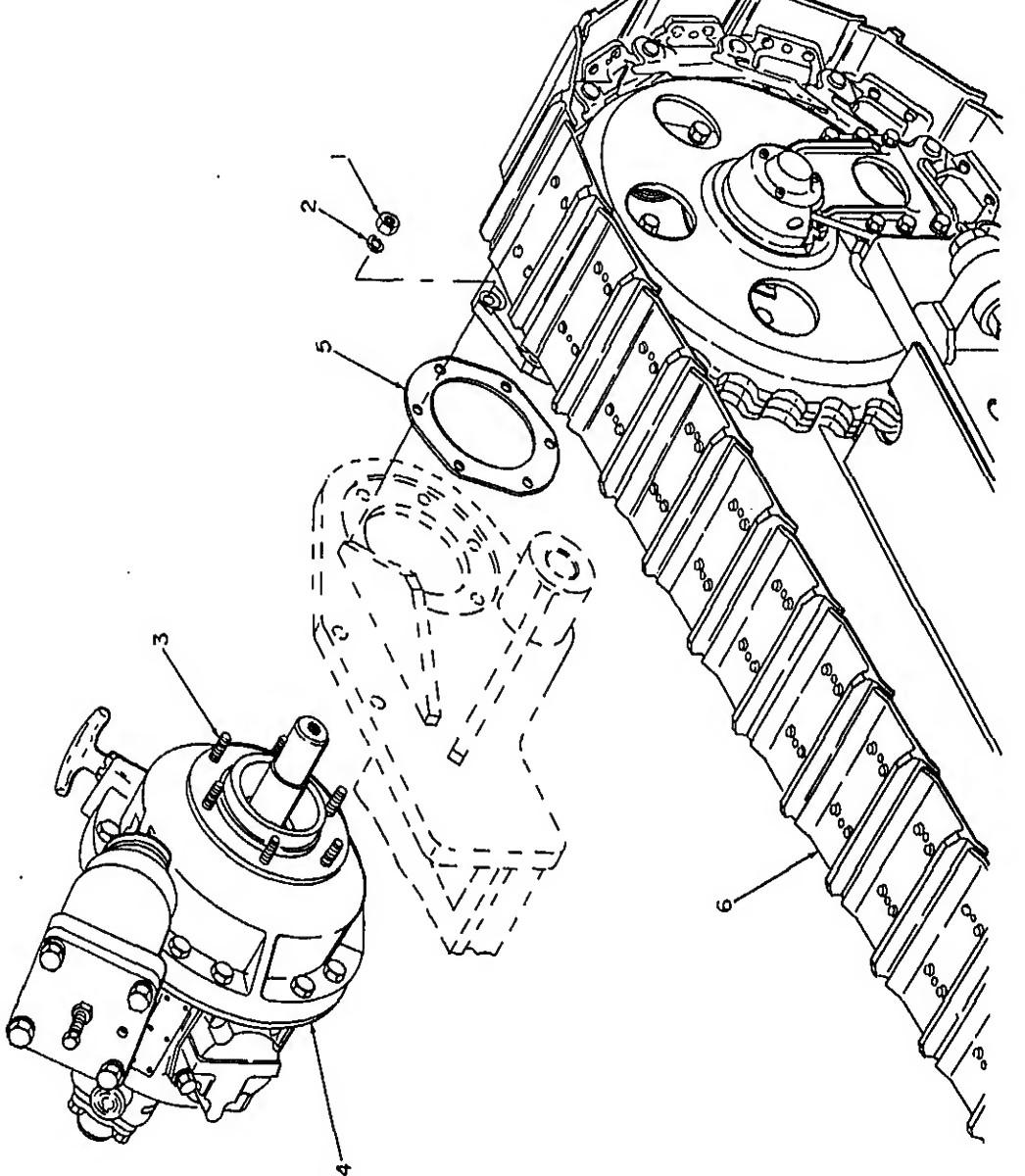


MEC 3820-239-15

- 1 Vent cap
- 2 Magnetic drain plug, 8/4-16
- 3 Gasket
- 4 Screw, cap, hex-hd, 1-8 x 2 1/4 in .(2)
- 5 Screw, cap, hex-hd, 1-8 x 3 1/4 in. (3)
- 6 Nut, hex, 1-8 (3)
- 7 Washer, lock, 1 in. (5)
- 8 Boom base assembly
- 9 Main frame

Figure 5-5. Removal and installation of boom assembly.

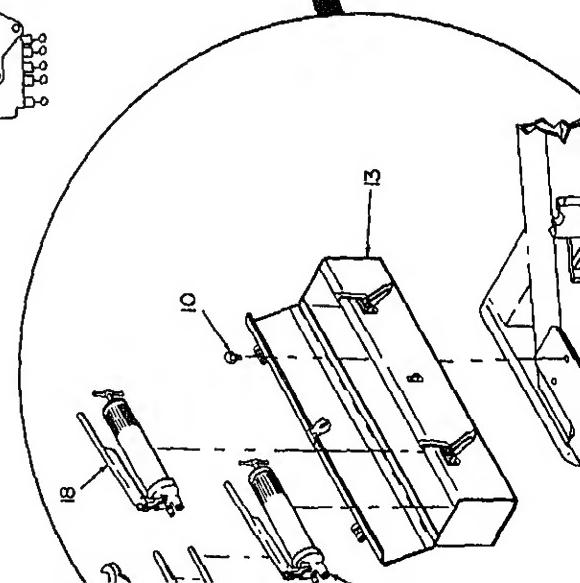
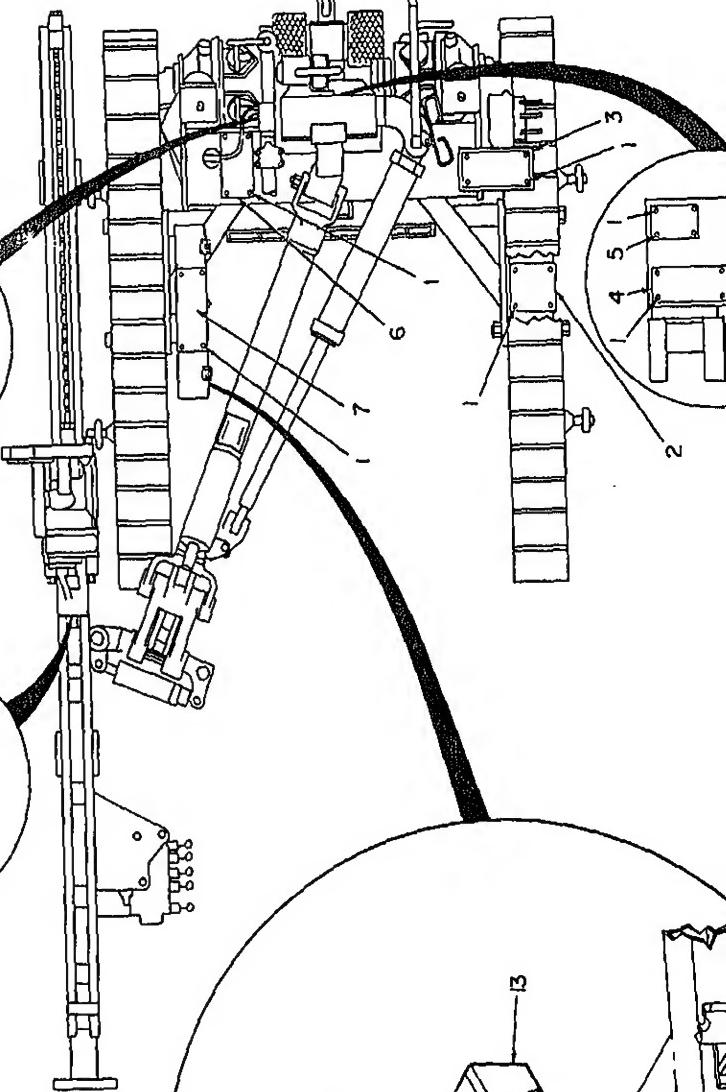
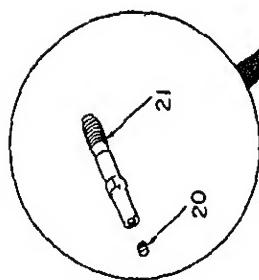
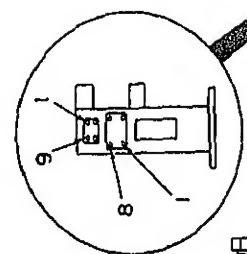
- (11), and lock washers (12), and remove the tool box from the frame.
- (2) To remove damaged plates, replace the four drive screws (1) holding



ut, hex, 5/8-11 (6)
asher lock, 5/8 in. (6)
nd, 5/8-11 x 3 in. (6)

- 4 Complete traction drive (in shown, rh opposite)
- 5 Spacer plate gasket
- 6 Traction unit (lh shown, rh opposite)

Figure 5-6—Continued.



screw, binding-hd, 3/8 in. long (32)
portation data instruction plate
public valve operation instruction plate
filling operation instruction plate
operation instruction plate
operator operation instruction plate
operator identification plate
factory identification plate
serial nameplate
, cap, hex-hd, 1/2-13 x 1 in. (4)
hex, 1/2-13 (3)

12 Washer, lock, 1/2 in. (4)
13 Tool box
14 Open end wrench, 1 in.
15 Open end wrench, 1 5/16 in.
16 Track adjusting wrench
17 Grease gun hose assembly with coupler, 12 in.
18 Grease gun
19 Grease gun
20 Shank piece seal (1 rqr plus 11 spares supplied)
21 Shank piece (1 rqr plus 11 spares supplied)

Figure 5-7—Continued.

CHAPTER 6

REPAIR INSTRUCTIONS

Section I. DRIFTER DRILL

-1. General

This section contains repair instructions for the drifter drill.

-2. Removal

Remove the drifter drill as described in paragraph 3-33.

-3. Disassembly

Disassemble drifter drill in the numerical sequence as illustrated on figure 6-1. Follow the procedures specified below:

- a. If the shank piece is attached to the drifter drill, remove chuck jaw retainer bolts (1, figure 1) and nuts (2), and separate chuck jaw retainer (3) with the shank piece.
- b. Remove hose stem (4) with related parts through 9), air connection plug (10), and power hose connection (12) with related parts 3 and 14).
- c. Remove tube retainer (15) and O ring 6). Remove blower tube (19) with blower be washer (17) and blower tube rubber 8) attached.
- d. Remove nuts (21) and assembly rods 0), and pull air inlet housing (42) and backhead (36), with assembled parts intact, from cylinder (54).

Note. The air inlet housing and backhead are held together to avoid the possibility of the rotation pawls (41) falling out.

- e. Separate air inlet housing (42) from backhead (36), and remove rifle bar (37).

cam pinion handle (25) from the top of backhead, and slide rotation selector cam (26) out from the bottom of the backhead.

- g. Remove backhead cap (27), and all piston parts (29 through 35) from backhead (36).

Note. If the parts do not come out easily, insert a screwdriver into the cam pinion hole of the backhead, and force out the piston.

- h. Force rotation pawl housing (38) out of air inlet housing (42), and remove rotation pawl housing key (39), rotation pawl pliers (40), and rotation pawls (41).

- i. Remove the assembled valve chest parts from cylinder (54) by inserting a 3/4-inch diameter bolt (approximately 10 inches long) into the cylinder with the head down. Engage the bottom of valve chest cover (49) with the bolt, and pull the parts out of the cylinder.

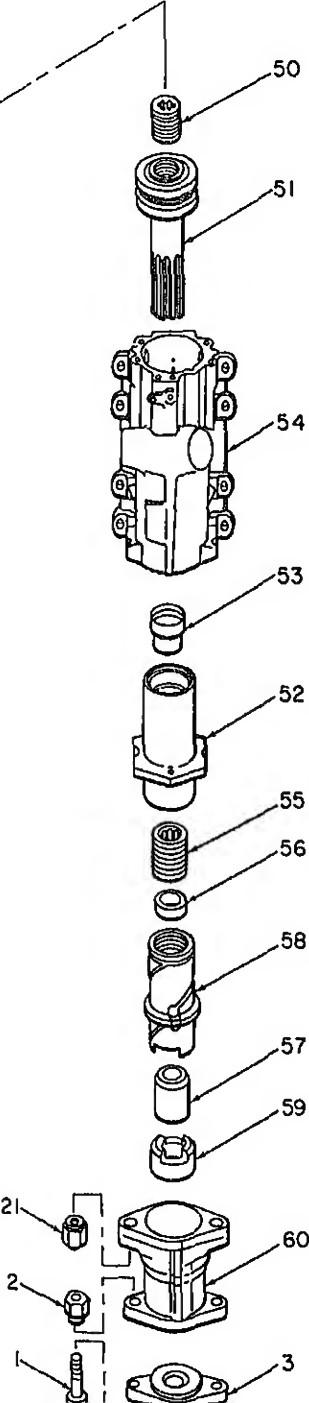
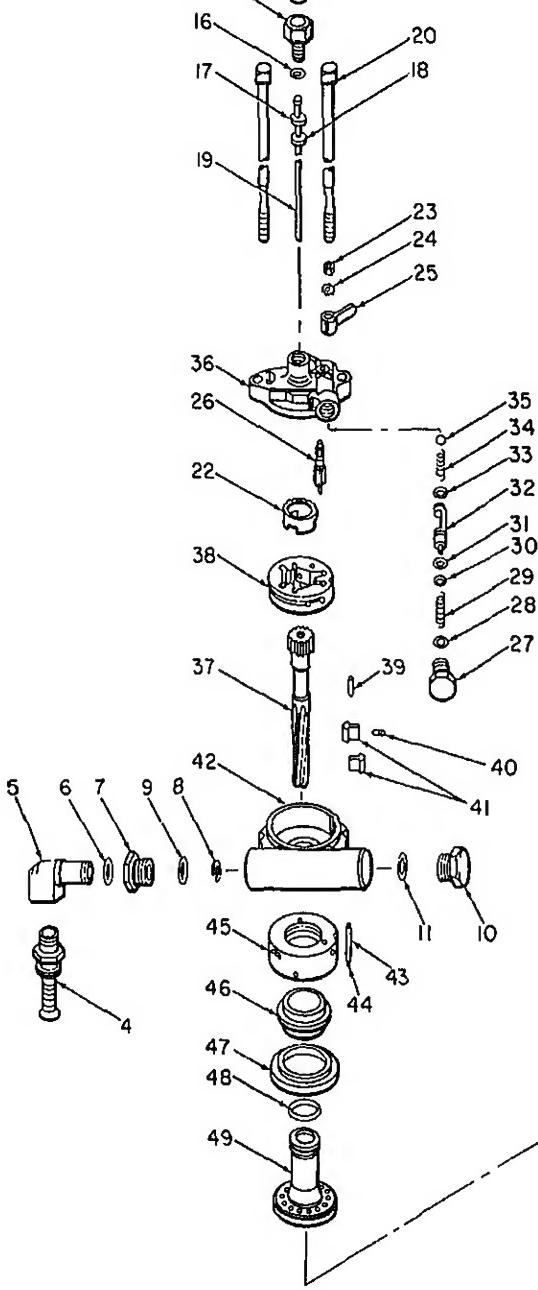
Caution: When the valve chest parts are removed, be careful not to lose valve chest key (43).

- j. Slide out valve chest cover (49). Remove valve chest key (46). Separate front valve chest (48) from the valve chest cover by inserting a screwdriver through the ports in the cover and driving it evenly with a mallet.

Caution: Tap the front valve chest even to avoid cocking the part in the cover.

- k. Insert rifle bar (37) through the cylinder (54) and wedge it into piston (51). Pull piston out of the cylinder.

- l. Separate the cylinder (54) with assembly.



Air connection	35 Cam piston spring seat
O-ring	36 Backhead
Air connection cap	37 Rifle bar
Retaining ring	38 Rotation pawl housing
O-ring	39 Rotation pawl housing key
Air connection plug	40 Rotation pawl plunger (6)
O-ring	41 Rotation pawl (6)
Blower hose connection	42 Air inlet housing
O-ring	43 Valve chest key
Blower hose connection cap	44 O-ring (2)
Tube retainer	45 Back valve chest
O-ring	46 Valve
Blower tube washer	47 Front valve chest
Blower tube rubber	48 O-ring
Blower tube	49 Valve chest cover
Assembly rod (2)	50 Rifle nut
Nut, hex, 7/8-14 (2)	51 Piston
Rotation selector cam	52 Piston stem bearing
Nut, hex, 1/2-20	53 Piston stem bearing sleeve
Washer, lock, external tooth 1/2 in.	54 Cylinder
Rotation selector cam pinion handle	55 Chuck nut
Rotation selector cam pinion	56 Chuck nut spacer
Backhead cap	57 Shank aligner
O-ring	58 Chuck
Right-hand cam piston spring	59 Chuck jaw
Wear washer	60 Fronthead

Figure 6-1—Continued.

n. Separate remaining parts as necessary.

4. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

5. Inspection and Repair

a. *General.* Inspect all parts for wear and heat checks. Inspect for wear as per table 4-1.

b. *Piston and Cylinder.* If clearance between piston (51) and cylinder (54) is excessive, determine which part is worn by inserting a new piston in the cylinder and rechecking clearance. Clearance is then satisfactory, the piston was worn.

c. *Rifle Bar.* Inspect rifle bar (37) for wear of ratchet teeth. If the teeth are rounded to a 1/16-inch radius, replace the rifle bar.

to a 1/16-inch radius on one edge. If the parts are worn on both edges, they must be replaced.

6-6. Reassembly

Reassemble drifter drill in reverse of numerical sequence as illustrated on figure 6-1. Note the following special procedures.

a. When assembling rotation pawls (41, 6-1), insert them into the rotation pawl housing (38), and then press the pawl housing into the air inlet housing (42).

Caution: Use extreme care to keep the keyway of rotation pawl housing (38) aligned with the keyway of air inlet housing (42). Make sure that the cutout section of the rotation pawl housing is exposed.

b. Apply a dab of grease on each rotation

ion (26) in backhead (36), make sure that the alignment marks (punch dots) on the pinion are aligned with the marks on rotation selector cam (22).

d. When installing rotation selector cam piston (32) into backhead (36), make sure that the groove in the piston is aligned with the pinion. If the alignment marks are not visible, proceed as follows:

- (1) Install rotation selector cam piston (32) with related parts in backhead (36).
- (2) Install rotation selector cam pinion (26) in backhead (36) and mesh with

handle (25) is attached in the neutral position (4 the stop), the center piston will be meshed.

- (3) Mark the alignment of the meshing teeth of both the pinion, to facilitate repair.

6-7. Installation

See figure 8-12 and install the assembly on the drill mounting plate.

Section II. COMPLETE DRILL MOUNTING

6-8. General

This section contains repair instructions for the complete drill mounting. The complete drill mounting consists of the remote control manifold, air feed motor, centralizer, drill mounting plate, and complete drill guide.

6-9. Removal

Remove the complete drill mounting as described in paragraph 5-12a.

6-10. Disassembly

a. *Complete Drill Mounting.* Disassemble complete drill mounting in the numerical sequence as illustrated on figure 6-2.

Note. Air hoses and hose fittings are not shown on figure 6-2 in order to avoid confusion. See figure 1-4 for complete piping diagram.

b. *Remote Control Manifold.* Disassemble remote control manifold in the numerical sequence as illustrated on figure 6-3.

Note. The manifold is made with five valves, four of which are used. The quantities specified in the legend for figure 6-3 reflect the actual parts installed.

c. *Air Feed Motor.* Disassemble the motor in the numerical sequence as illustrated on figure 6-4 (Sheets 1 through 3). Follow the procedures specified below:

- (1) Remove magnetic plug (43) and pipe plugs (45), and remove the tube from the worm housing.
- (2) Remove manifold bolt (46), lock washers (8) and separate the manifold (9) from cylinder (10). Remove seal rings (11).
- (3) Remove live air stud (14), lock washer (12), and reverse valve hole stud (13), air stud (15). Do not move reverse valve (18).
- (4) Remove screws (20) and lock washers (21), and lift off the lift off plate (22) and thrust plate (23). Remove upper bearing cap (24), bearing spring (25).
- (5) Remove screws (27) and lock washers (28), and separate the gear case (71) and gear case (72) from the cylinder case (96).
- (6) Remove self-locking nuts (30) and lock washers (31) from the cylinder case (96).

- from stud (33). Remove rotary valve (34).
-) Only if worn or damaged, press rotary valve bushing (36) out of cylinder case (96), through the exhaust cover opening.

Note. Cylinder liner key (35) is permanently installed in the cylinder case to locate and align the rotary valve bushing (36). Do not attempt to remove the key.

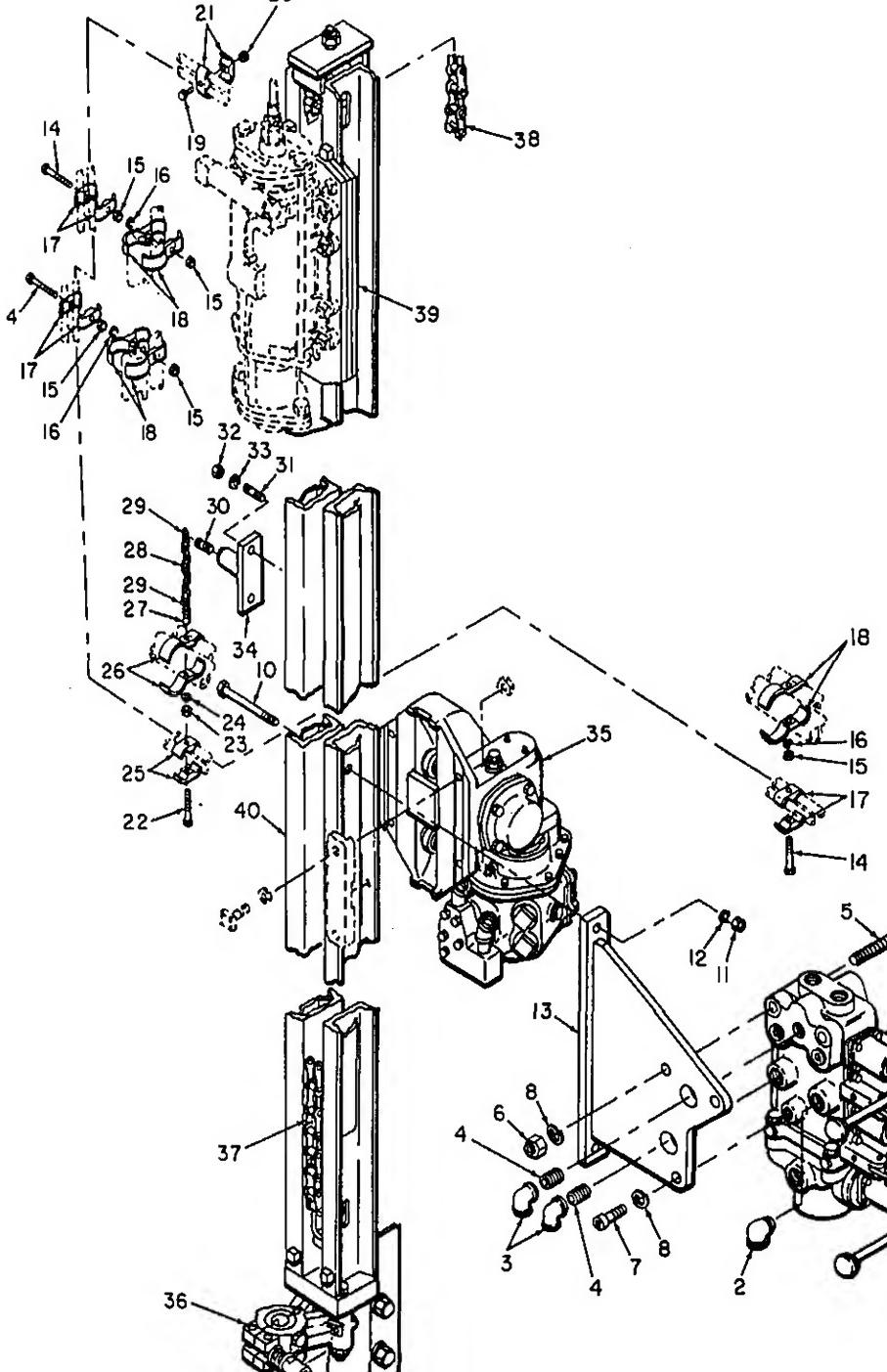
-) Remove cylinder liner caps (39) from cylinder case (96).
-) Remove screws (41), lock washers (42), and housing cap (43) with housing cap shim (44).
-) Remove worm shaft grease seal (62).
-) Using a suitable puller, remove the assembled worm shaft (68), with inner and outer worm bearings (64 and 69), long and short worm spacers (65 and 68), worm key (67), and worm (66).

Note. Rotate worm shaft (68) to free worm (66) from worm wheel (64).

-) Using a suitable bearing puller to bear on the inner races, remove inner worm bearing (64) and outer worm bearing (69) from worm shaft (68). Remove other parts from the worm shaft.
-) Cut or straighten the ends and remove cotter pins (50). Remove sprocket shaft nuts (51) and sprocket shaft washers (52).
-) Using a suitable press, bear on the sprocket end of sprocket shaft (56), until sprocket (59) and sprocket key (58) are freed and can be removed from the opening in the side of worm housing (71).

worm wheel bearing (67) from sprocket shaft (56).

- (18) Remove worm wheel (54) and worm wheel key (55) from sprocket shaft (56).
- (19) Remove lubrication fittings (46) from idler wheel shafts (47). Press out the idler wheel shafts from idler wheel bushings (49) and worm housing (71). Remove idler wheels (48) and the idler wheel bushings. Press the bushings out of the idler wheels.
- (20) Remove screws (76), lock washers (77), and crank shaft cap (78).
- (21) Using a suitable bearing puller, remove crank pinion parts, consisting of crank pinion (73), lower crank bearing (75), and Woodruff key (74), from lower throw crank (90).
- (22) Rotate the crank assembly until one piston (82) is at the end of its stroke, farthest out of cylinder liner (80).
- (23) Raise the crank assembly to free the piston from the cylinder liner. When the piston is free from the liner, move the crank sideways to free the other piston on the same throw crank (89 or 90) from its cylinder liner (80).
- (24) Free the other two pistons (82) from their cylinder liners (80) in the same manner as in step (23).
- (25) Drive out crank pins (85) from crank center piece (95), and upper and lower throw cranks (89 and 90). Cut or straighten the ends and remove cotter pin (86). Remove castellated nut (87) and pinch bolt (88), securing the halves of crank center piece (95). Insert the pinch bolt from the opposite side to spread crank center piece (95), and pull out upper throw crank.



Nipple, 1 x 1 1/2 in. (2)	24	Washer, lock, 8/8 in.
Screw, cap, hex-hd, 3/4-10 x 6 in. (2)	25	Hose clamp (2)
Nut, hex, 8/4-10 (2)	26	Clamp half (2)
Screw, cap, hex-hd, 8/4-10 x 1 1/4 in.	27	Eye nut
Washer, lock, 8/4 in. (3)	28	Straight link chain
Remote control manifold	29	Cold shut (2)
Screw, cap, hex-hd, 3/4-10 x 7 1/2 in. (2)	30	Stud
Nut, hex, 8/4-10 (2)	31	Stud, 5/8-11 x 2 1/4 in. (2)
Washer, lock, 8/4 in. (2)	32	Nut, hex, 5/8-11 (2)
Remote control manifold mounting bracket	33	Washer, lock, 5/8 in. (2)
Bolt, hex-hd, 3/8-16 x 3 1/2 in. (3)	34	Hose hangar block
Nut, hex, 8/8-16 (8)	35	Air feed motor assembly
Washer, lock, 8/8 in. (8)	36	Centralizer
Hose clamp half (6)	37	Feed chain
Hose clamp half (6)	38	Feed chain coupler link (2)
Screw, cap, hex-hd, 1/4-20 x 1 1/4 in.	39	Drill mounting plate
Nut, hex, 1/4-20	40	Complete drill guide

Figure 6-2—Continued.

- and inside connecting rods (93 and 94).
(27) Remove outside connecting rods (93) and inside connecting rods (94) from the upper and lower throw cranks (89 and 90).
(28) Press out connecting rod bushings (92) from the connecting rods. Pull crank pin sleeves (91) off upper and lower throw cranks (89 and 90).
(29) Remove nut (83). Using a suitable bearing puller to bear on the inner race, pull upper crank bearing (84) off the shaft of upper throw crank (89).
(30) Only if worn or damaged, press cylinder liners (80) out of cylinder case (96), using a wooden block to bear on the liner. Make sure that the block does not interfere with cylinder liner keys (79).

Note. Do not remove cylinder liner keys (79), which are for locating and aligning the cylinder liners in cylinder case (96).

. Centralizer. Disassemble centralizer in numerical sequence as illustrated on figure

f. *Complete Drill Guide.* Disassemble complete drill guide in the numerical sequence illustrated on figure 6-7.

6-11. Cleaning

Clean all parts with an approved solvent and blow dry with compressed air.

6-12. Inspection and Repair

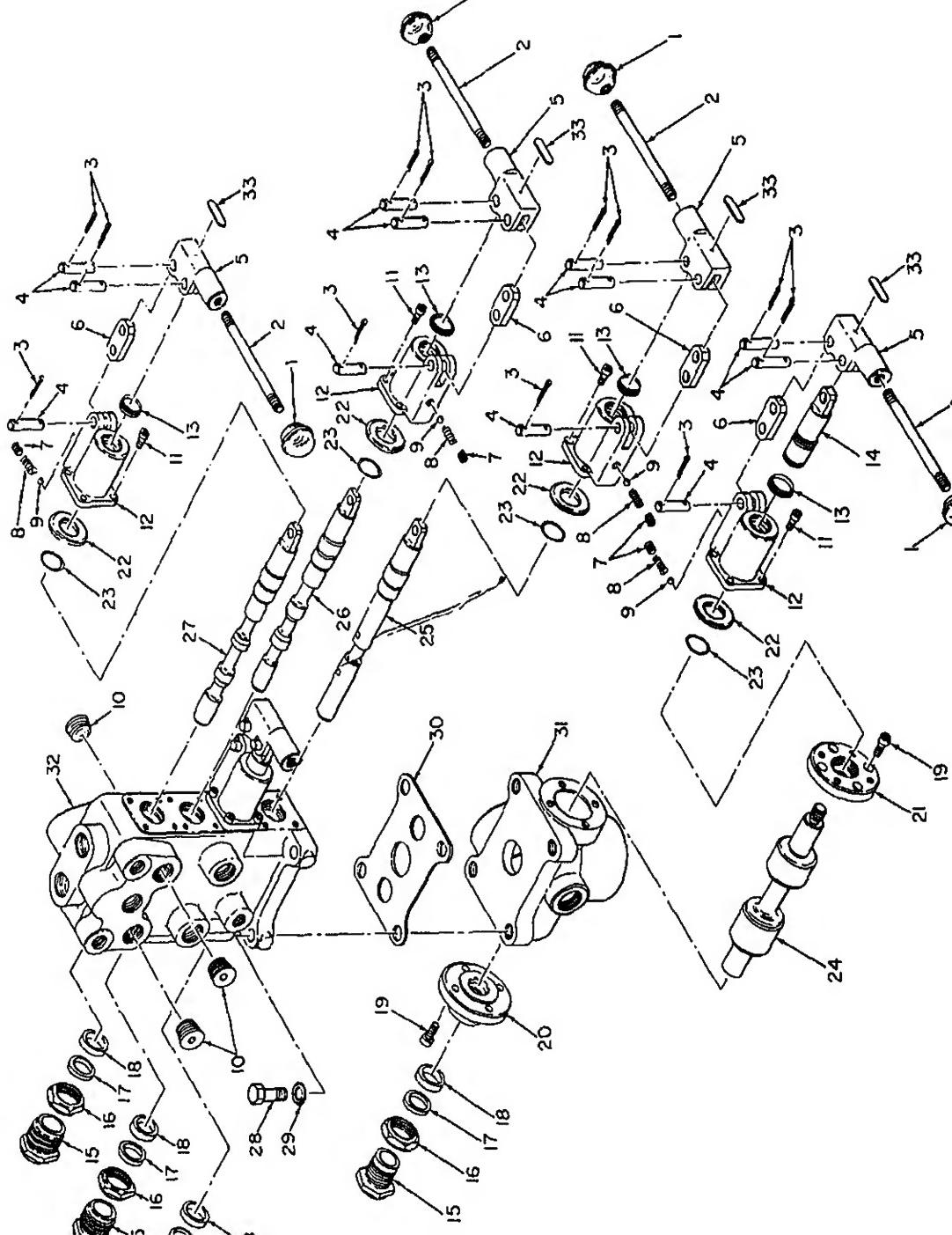
a. Inspect all parts for wear and damage and replace if necessary.

b. Inspect all bearings for cracks, looseness and wear. Replace if unserviceable.

c. Inspect all gears and pinions for crack chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of a part.

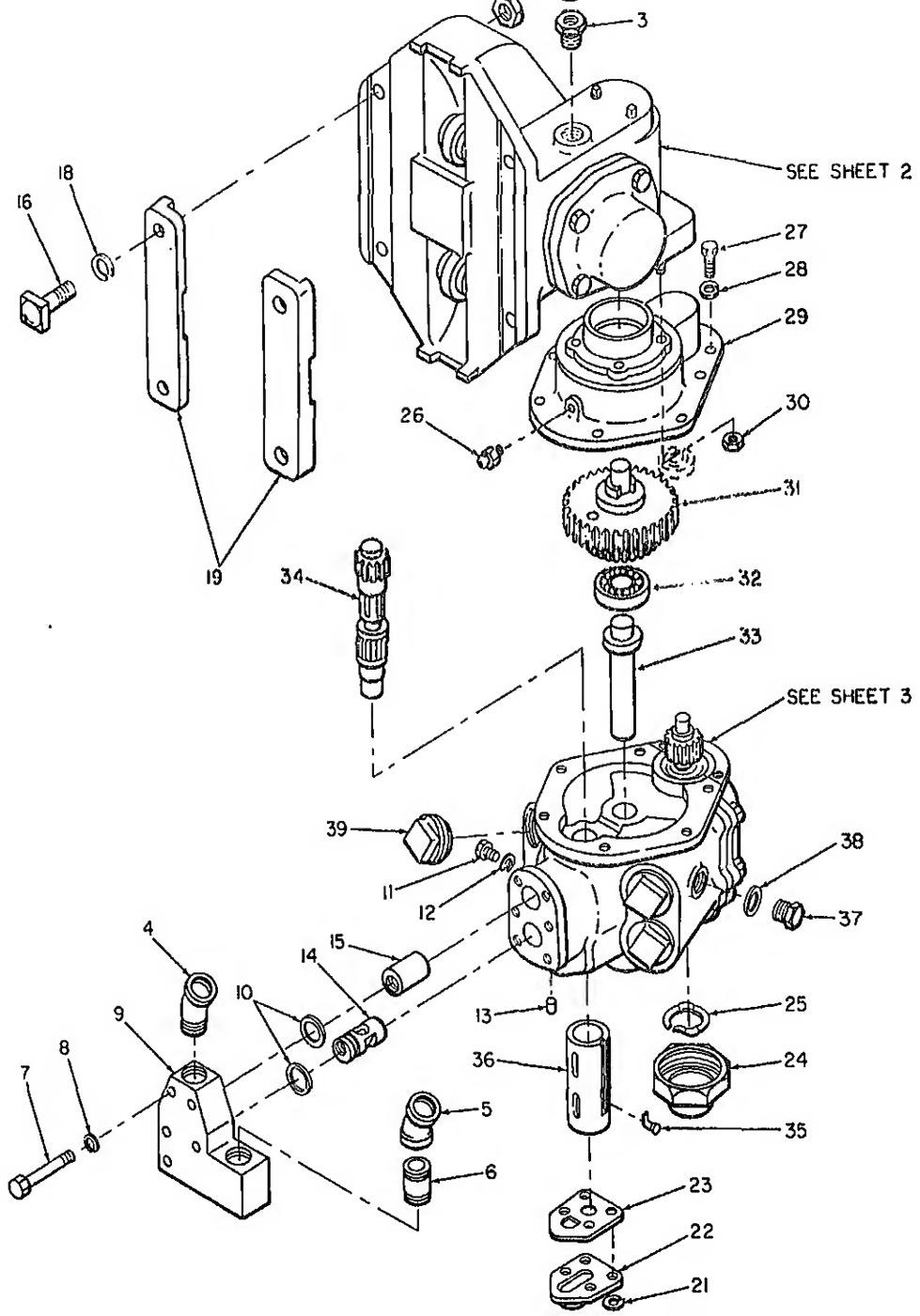
d. Inspect upper and lower throw cranks (89 and 90, fig. 6-4) and crank center piece (95) for scoring marks, cracks, wear, and other damage. If any of the three parts is damaged the entire set must be replaced, since the parts are machined together and comprise a matched set.

e. Inspect connecting rod bushings (92) for wear. Using a micrometer or other suitable in-



12	Spool end cap (5)
13	Wiper (5)
14	Drill spool detent
15	Spool friction ring adjusting nut (5)
16	Jam nut, hex, 1 1/2-12 (5)
17	Friction washer (5)
18	Friction ring (5)
19	Screw, cap, hex-hd, 5/16-18 x 3/4 in. (8)
20	Drill spool friction end cap
21	Drill spool end cap plate
22	Alignment washer (5)
hd, 1/8 in. (5)	
25	
26	
27	
28	
29	
30	
31	
32	
33	

Figure 6-8—Continued.



4	Stress cone, 45° x 3/4 in.	24	Upper bearing cap
5	Elbow, 45° x 3/4 in.	25	Upper bearing spring
6	Nipple, 3/4 x 2 in.	26	Lubrication fitting, 1/8 in.
7	Manifold bolt, hex-hd, No. 12-24 x 1 3/4 in. (6)	27	Screw, cap, hex-hd, 5/16-24 x 3/4 in. (8)
8	Washer, lock, No. 12 (6)	28	Washer, lock, 5/16 in. (8)
9	Motor air manifold	29	Gear case
10	Seal ring (2)	30	Nut, self-locking, hex, 3/8-24 (4)
11	Live air stud screw	31	Drive gear
12	Washer, lock	32	Thrust bearing
13	Reverse valve hole stud pin	33	Bearing stud
14	Reverse valve hole stud	34	Rotary valve
15	Live air stud	35	Cylinder liner key
16	Screw, cap, sq-hd, 5/8-11 x 2 1/2 in. (4)	36	Rotary valve bushing
17	Nut, hex, 5/8-11 (4)	37	Grease plug
18	Washer, lock, 5/8 in. (4)	38	Grease plug washer
19	Worm housing clamp (2)	39	Cylinder liner cap (4)
20	Screw, cap, hex-hd, 5/16-24 x 3/4 in. (4)		

Figure 8-4(1)—Continued.

icks, burrs, and elongated pin holes. Remove minor nicks and burrs with a fine file or handstone. Replace if other damage is evident.

g. Inspect pistons (82) for cracks, nicks, burrs, scoring marks, and out-of-round condition. Check that piston wrist pins (81) have a smooth sliding fit in pistons and connecting rods (93 and 94). Replace pistons if any damage is evident. Do not attempt to repair damaged pistons.

h. Inspect cylinder liners (80) for scoring marks, out-of-round condition, and wear. Using a micrometer or other suitable instrument, check the bore of the cylinder liners. If worn to more than 1.753 inches, replace the cylinder liners.

i. If new pistons (82) or cylinder liners (80) are to be installed, it may be necessary to lap the pistons in the cylinder liners. Use a very fine, mild lapping compound. Install the connecting rod (93 or 94) on the piston to use as a handle. Lap until a smooth, sliding fit is obtained. After lapping, clean parts with an approved solvent to remove all traces of lapping compound.

j. Inspect rotary valve (34) for scoring

k. Inspect rotary valve bushing (8), sprocket and worm spacers (61, 65, and 66), and idler wheel bushings (49) for wear, scoring marks, and out-of-round condition. Replace parts if unserviceable.

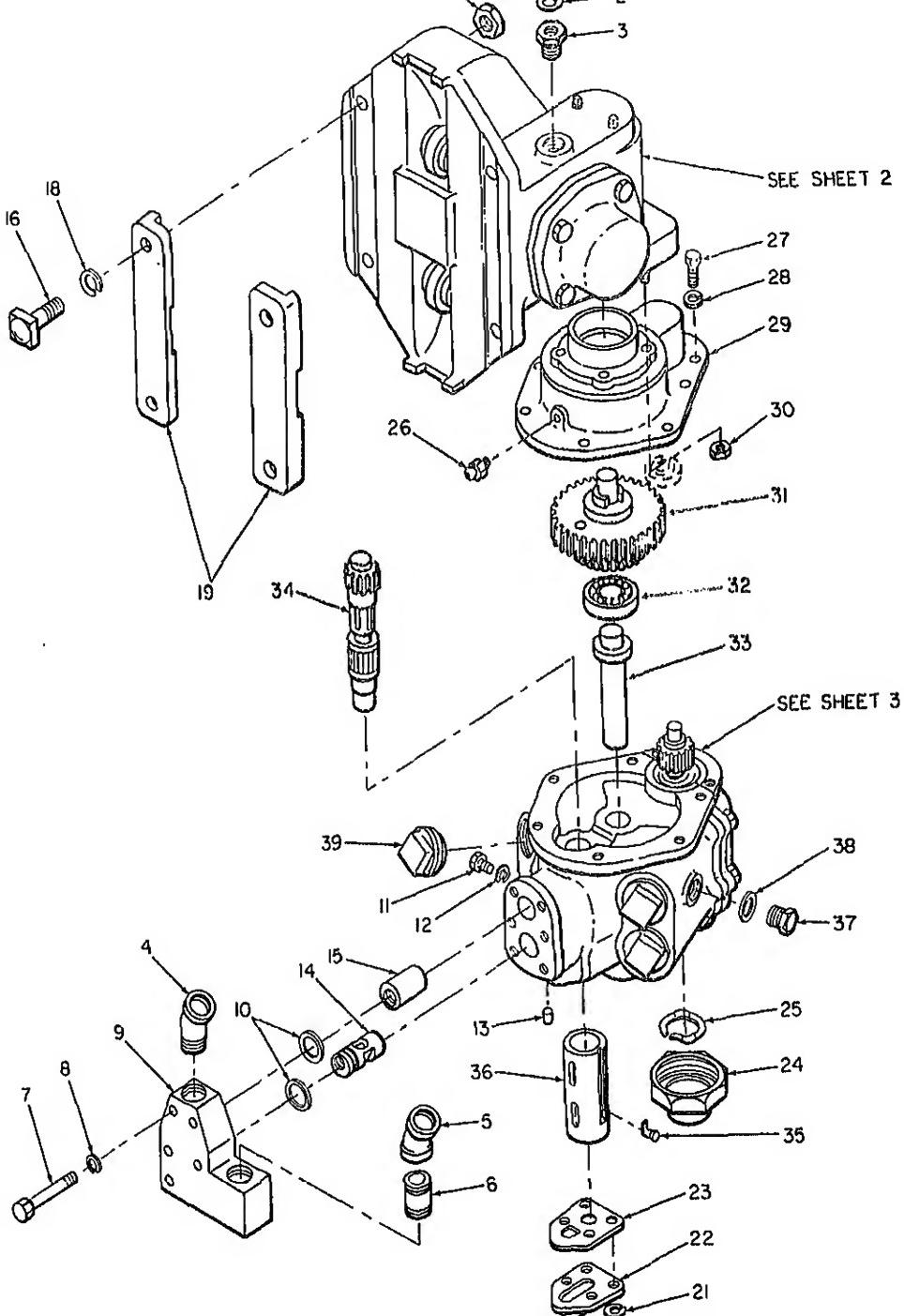
l. Inspect motor air manifold (9), cylinder case (96), gear case (29) and worm housing (71) for cracks, breaks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove minor nicks and burrs with fine file or handstone, and retap or rechase damaged threads. Replace the parts if damage cannot be repaired.

m. Inspect reverse valve hole stud (1), live air stud (15), bearing stud (33), idler wheel shafts (47), sprocket shaft (56), and worm shaft (68) for cracks, wear, and breaks. Replace parts if unserviceable.

n. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

o. Inspect compression springs (8, fig. 6-2) for damage and distortion. Replace if unserviceable.

p. Replace all O-rings in remote control manifold (fig. 6-3).



Silostem, 28 x 3/4 in.	24	Upper bearing cap
Elbow, 45° x 3/4 in.	25	Upper bearing spring
Nipple, 3/4 x 2 in.	26	Lubrication fitting, 1/8 in.
Manifold bolt, hex-hd, No. 12-24 x 1 3/4 in. (5)	27	Screw, cap, hex-hd, 5/16-24 x 3/4 in. (8)
Washer, lock, No. 12 (5)	28	Washer, lock, 5/16 in. (8)
Motor air manifold	29	Gear case
Seal ring (2)	30	Nut, self-locking, hex, 3/8-24 (4)
Live air stud screw	31	Drive gear
Washer, lock	32	Thrust bearing
Reverse valve hole stud pin	33	Bearing stud
Reverse valve hole stud	34	Rotary valve
Live air stud	35	Cylinder liner key
Screw, cap, sq-hd, 5/8-11 x 2 1/2 in. (4)	36	Rotary valve bushing
Nut, hex, 5/8-11 (4)	37	Grease plug
Washer, lock, 5/8 in. (4)	38	Grease plug washer
Worm housing clamp (2)	39	Cylinder liner cap (4)
Screw, cap, hex-hd, 5/16-24 x 3/4 in. (4)		

Figure 6-4(1)—Continued.

cks, burrs, and elongated pin holes. Remove minor nicks and burrs with a fine file or handstone. Replace if other damage is evident.

g. Inspect pistons (82) for cracks, nicks, burrs, scoring marks, and out-of-round condition. Check that piston wrist pins (81) have a smooth sliding fit in pistons and connecting rods (93 and 94). Replace pistons if any damage is evident. Do not attempt to repair damaged pistons.

h. Inspect cylinder liners (80) for scoring marks, out-of-round condition, and wear. Using a micrometer or other suitable instrument, check the bore of the cylinder liners. If worn to more than 1.753 inches, replace the cylinder liners.

i. If new pistons (82) or cylinder liners (80) are to be installed, it may be necessary to lap the pistons in the cylinder liners. Use a very fine, mild lapping compound. Install the connecting rod (93 or 94) on the piston to use as a handle. Lap until a smooth, sliding fit is obtained. After lapping, clean parts with an approved solvent to remove all traces of lapping compound.

j. Inspect rotary valve (24) for scoring

k. Inspect rotary valve bushing (83), sprocket and worm spacers (61, 65, and 66), and idler wheel bushings (49) for wear, scoring marks, and out-of-round condition. Replace parts if unserviceable.

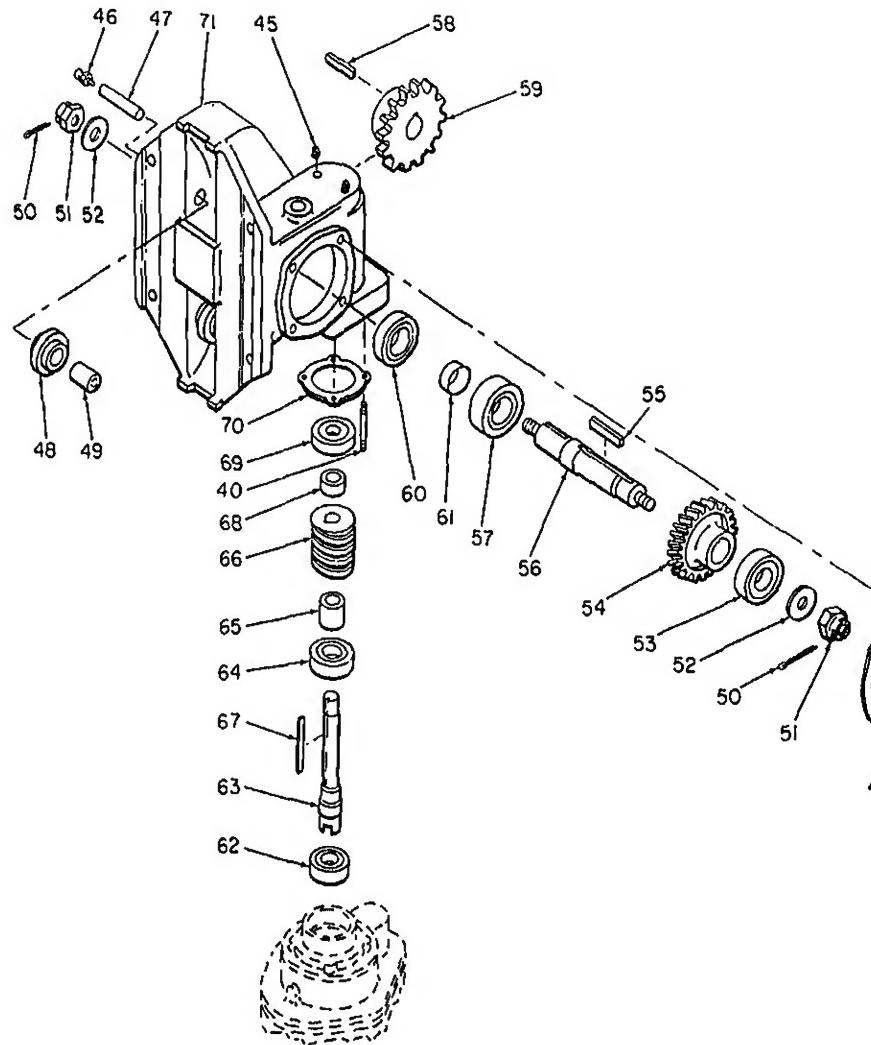
l. Inspect motor air manifold (9), cylinder case (96), gear case (29) and worm housing (71) for cracks, breaks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove minor nicks and burrs with a fine file or handstone, and retap or rechase any damaged threads. Replace the parts if damage cannot be repaired.

m. Inspect reverse valve hole stud (15), live air stud (15), bearing stud (33), idler wheel shafts (47), sprocket shaft (56), and worm shaft (63) for cracks, wear, and breaks. Replace parts if unserviceable.

n. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

o. Inspect compression springs (8, fig. 6-3) for damage and distortion. Replace if unserviceable.

p. Replace all O-rings in remote control manifold (fig. 6-3).



Housing cap shim	60	Sprocket shaft gear seal
Pipe plug, 1/8 in. (2)	61	Sprocket spacer
Lubrication fitting, 1/8 in. (2)	62	Worm shaft grease seal
Idler wheel shaft (2)	63	Worm shaft
Idler wheel (2)	64	Inner worm bearing
Idler wheel bushing (2)	65	Long worm spacer
Cotter pin (2)	66	Worm
Sprocket shaft nut, 5/8-18 (2)	67	Worm key
Sprocket shaft washer, 5/8 in. (2)	68	Short worm spacer
Outer worm wheel bearing	69	Outer worm bearing
Worm wheel	70	Gear case shim
Worm wheel key	71	Worm housing

Figure 6-4(2)—Continued.

13. Reassembly

a. *Complete Drill Guide.* Reassemble complete drill guide in reverse of numerical sequence as illustrated on figure 6-7.

b. *Drill Mounting Plate.* Reassemble drill mounting plate in reverse of numerical sequence as illustrated on figure 6-6.

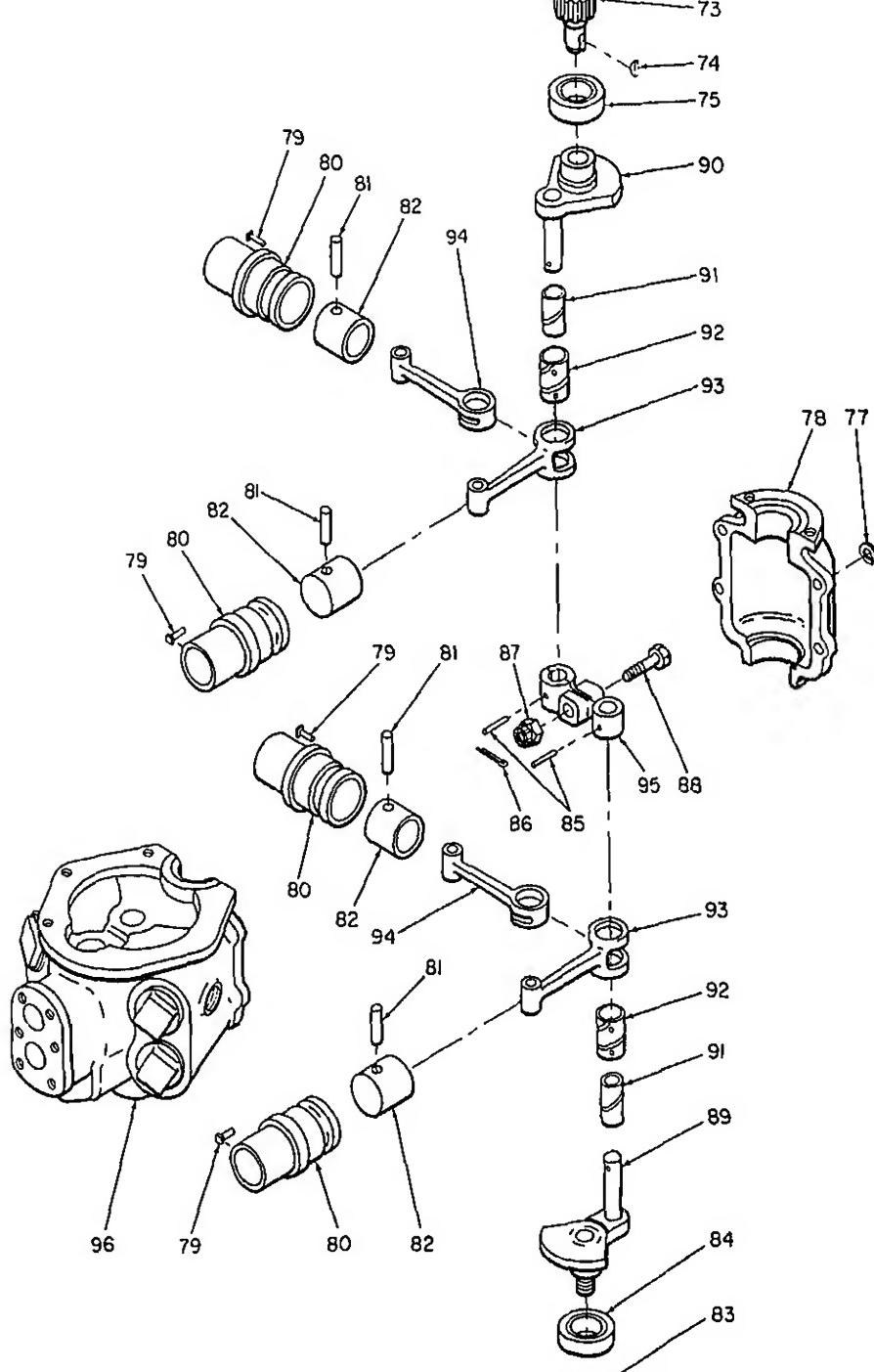
c. *Centralizer.* Reassemble centralizer in reverse of numerical sequence as illustrated on figure 6-5.

d. *Air Feed Motor.* Reassemble air feed motor in reverse of numerical sequence as illustrated on figure 6-4 ((1) through (8)) follow the procedure specified below:

Note. Coat all parts with clean engine oil as an aid in reassembly.

- (1) Install cylinder liners (80, fig. 6-4) in cylinder case (96) using cylinder liner keys (79) to aline the keyways of the cylinder liners. Use a hammer and wooden block to seat the cylinder liners. Install cylinder liner caps (89).
- (2) Install connecting rods (93 and 94) in pistons (82), and secure with piston wrist pins (81).
- (3) Insert Woodruff key (74) in the keyway of crank pinion (73). Using a suitable bearing pusher to bear on

- (4) Alining the Woodruff key with slot in lower throw crank (90), stall the crank pinion and attach parts.
- (5) Using a suitable bearing pusher bear on the inner race, install upper crank bearing (84) on upper throw crank (89). Install nut (83).
- (6) Mesh an inside connecting rod (91) with an outside connecting rod (92) and press connecting rod bushings (92) into the rods. Repeat the procedure for the other set.
- (7) Install crank pin sleeves (91) shafts of upper and lower throw cranks (89 and 90), and insert connecting rod bushings, with attached connecting rods and pistons into the crank pin sleeves.
- (8) Insert pinch bolt (88) through wrong side of crank center piece to spread the web.
- (9) Insert the assembled throw crank into crank center piece (95) so the "X" marked on the end of crank and the crank center piece matched. Aline the pin holes lightly tap in crank pins (85), move the pinch bolt (88) and ins-



Screw, cap, hex-hd, 5/16-24 x 3/4 in. (4)	89	Upper throw crank
Washer, lock, 5/16 in. (4)	90	Lower throw crank
Crank shaft cap	91	Crank pin sleeve (2)
Cylinder liner key (4)	92	Connecting rod bushing (2)
Cylinder liner (4)	93	Outside connecting rod (2)
Piston wrist pin (4)	94	Inside connecting rod (2)
Piston (4)	95	Crank center piece
Nut, hex, 9/16-20	96	Cylinder case
Upper crank bearing		

Figure 6-4(3)—Continued.

crank pins (85) and bend over the ends of the cotter pin.

(10) Install the assembled crank parts into cylinder case (96), being careful not to damage the pistons (82). Tilt the crank as necessary to allow each piston to enter its cylinder liner (80).

(11) Install crank shaft cap (78).

(12) Press idler wheel bushings (49) into idler wheels (48). Position the idler wheels in the recess of worm housing (71) and press idler wheel shafts (47) through the housing and the bushings. Install lubrication fittings (46) on the idler wheel shafts.

(13) Insert worm wheel key (55) in the slot of sprocket shaft (56). Aline the keyway of worm wheel (54) with the key, and press the worm wheel onto the shaft.

(14) Using a suitable bearing pusher to bear on the inner races, press inner and outer worm wheel bearings (57 and 58) onto sprocket shaft (56).

(15) Install sprocket shaft washer (52) and sprocket shaft nut (51) on the worm wheel end of sprocket shaft (56). Install cotter pin (50) and bend over the ends to lock the nut.

(16) Install sprocket spacer (61) and sprocket shaft gear seal (60) on the sprocket end of sprocket shaft (56).

(17) Insert sprocket key (58) in the slot o

sprocket fits over the shaft and the keyway is alined with the key. Secure the parts by installing sprocket shaft washer (52), sprocket shaft nut (51) and cotter pin (50).

(18) Install housing cap shim (44) and housing cap (43), and secure with screws (41) and lock washers (42).

(19) Using a suitable bearing pusher to bear on the inner race, install inner worm bearing (64) on worm shaft (63). Install long worm spacer (65). Insert worm key (67) in the slot of worm shaft (63), and install worm (66) over the key on the shaft. Install short worm spacer (68).

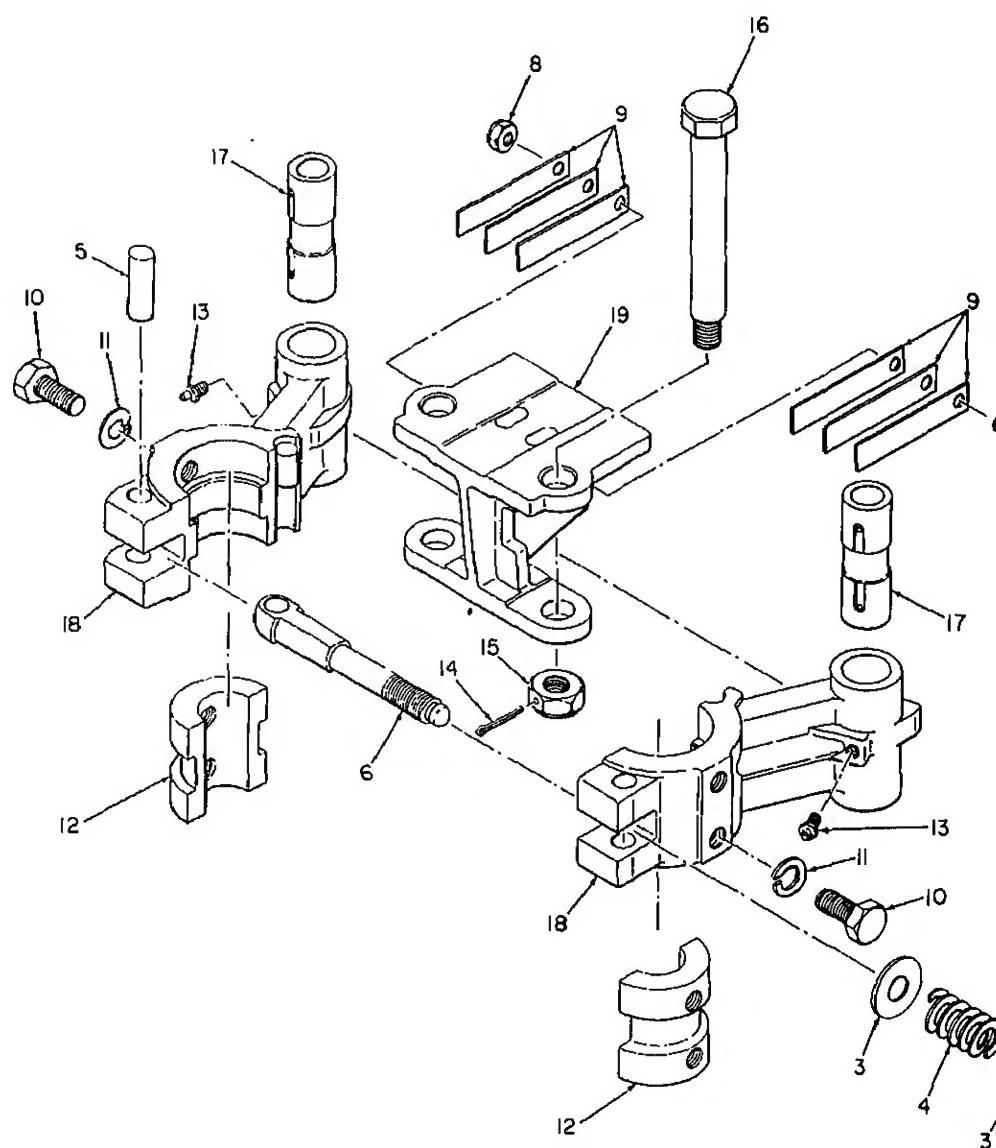
(20) Using a suitable bearing pusher to bear on the inner race, install outer worm bearing (69) on worm shaft (68).

(21) Install the assembled worm shaft parts (62 through 69) in worm housing (71), turning the shaft to engage worm (66) with worm wheel (54).

(22) Install worm housing studs (40) and place gear case shim (70) over the studs on the machined surface of worm housing (71).

(23) Install pipe plugs (45).

(24) Install worm shaft grease seal (62) in the upper (worm housing) end o



Centralizer swing bolt pin
Centralizer swing bolt
Screw, cap, hex-hd, 8/8-16 x 3 1/2 in.
Nut, self-locking hex, 8/8-16
Centralizer arm spring (6)
Screw, cap, hex-hd, 6/8-18 x 1 1/2 (4)

15 Nut, hex, slotted, 7/8-14 (2)
16 Centralizer arm bolt, 7/8-14 x 7 3/8 in. (2)
17 Centralizer arm bolt bushing (2)
18 Centralizer arm (2)
19 Centralizer bracket

Figure 6-5—Continued.

- (26) Press rotary valve bushing (36) into cylinder case (96) through the exhaust cover opening. Make sure that the keyway in the bushing is aligned with cylinder liner key (85). Ream the bushing if necessary.
- (27) Install rotary valve (84) into cylinder case (96).
- (28) Using a suitable bearing pusher to bear on the inner race, press thrust bearing (32), with the stamped marking THRUST HERE facing outward (away from the cylinder case), onto bearing stud (33). Press the bearing stud into the cylinder case (96).
- (29) Rotate the crank assembly (in the cylinder case) until the 1/16-inch milled cut in crank pinion (73) is closest to bearing stud (33). Align drive gear (81) on thrust bearing (32) so that the gear tooth marked with an arrow engages the milled cut in the crank pinion (fig. 6-8). Insert a suitable piece of wire or a nail through the hole in the drive gear, and rotate the rotary valve (84, fig. 6-4) until the nail engages the hole in the rotary valve pinion (see fig. 6-8). When these criteria are met, seat the drive gear so that it meshes with crank pinion (78, fig. 6-4) and the pinion of rotary valve (84).
- (30) Install crank pinion bearing (72) over drive gear (81) onto the shaft of crank pinion (73).

- (31) Install upper bearing spring (25) and upper bearing cap (24). Install thrust plate (23) and exhaust cover (22).
- (32) Install reverse valve hole stud (14) and live air stud (15) into cylinder case (96). Install seal rings (10) to motor air manifold (9).
- (33) Secure motor air manifold (9) to cylinder case (96).
- (34) Secure the assembled worm housing (71) and gear case (29) to cylinder case (96).
- (35) If the air feed motor is to be installed immediately, do not install worm housing clamps (19) until the motor is mounted on the drill guide.

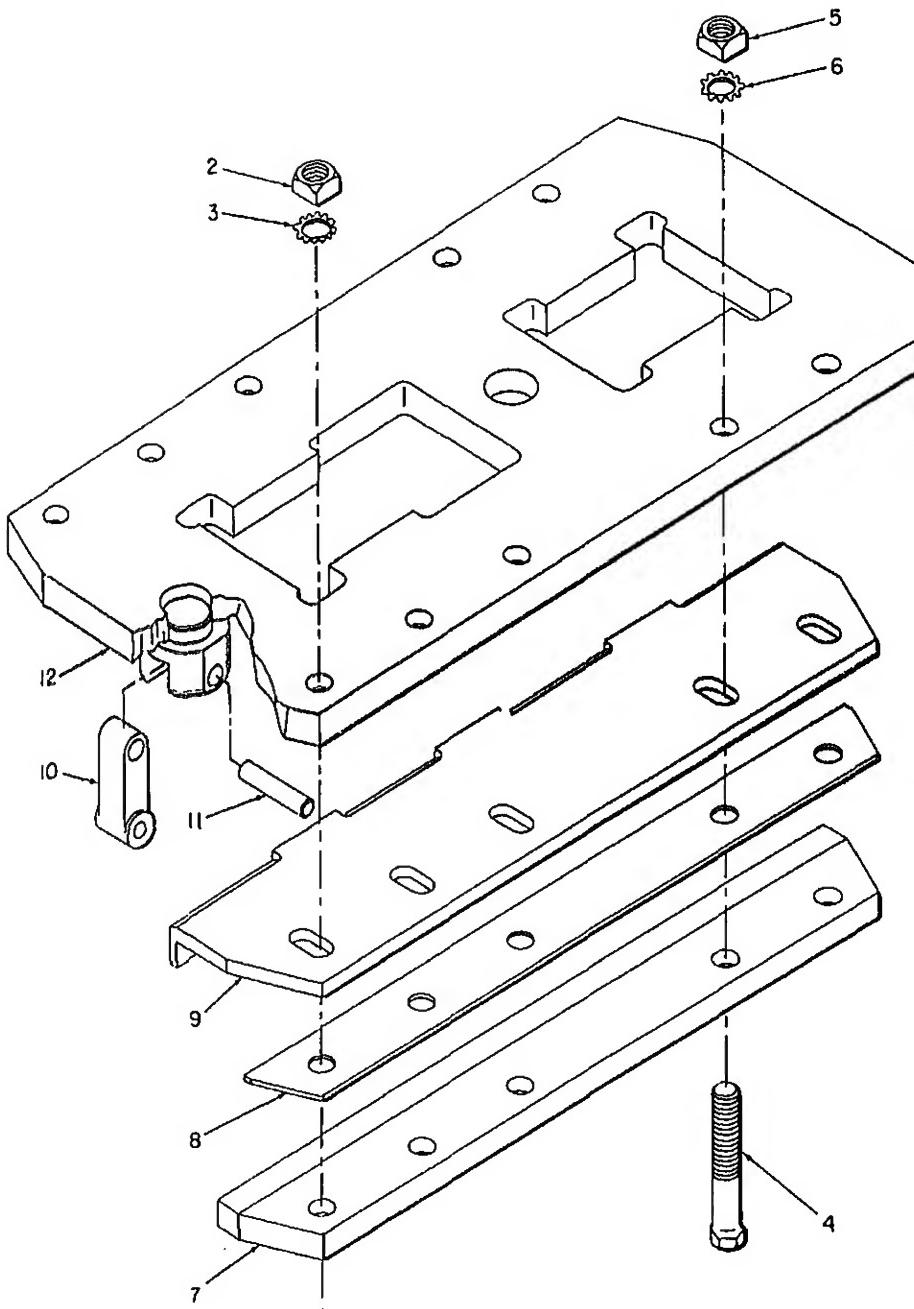
Note. If pistons (82) or cylinder liners (80) are replaced, it is recommended that the air feed motor be operated at approximately half-speed for several hours, to run in the parts.

e. *Remote Control Manifold.* Reassemble remote control manifold in reverse of numerical sequence as illustrated on figure 6-8.

f. *Complete Drill Mounting.* Reassemble complete drill mounting in reverse of numerical sequence as illustrated on figure 6-2.

6-14. Installation

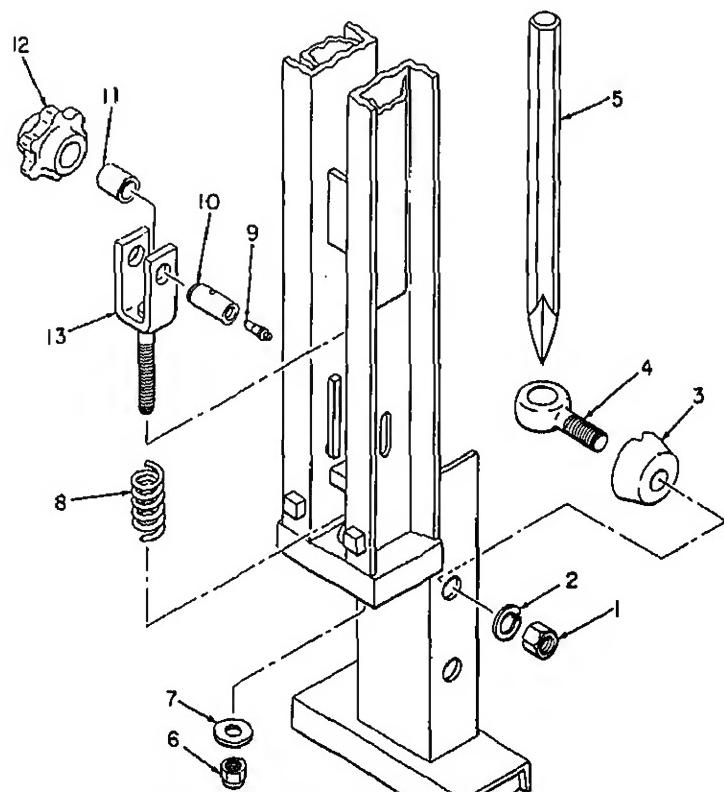
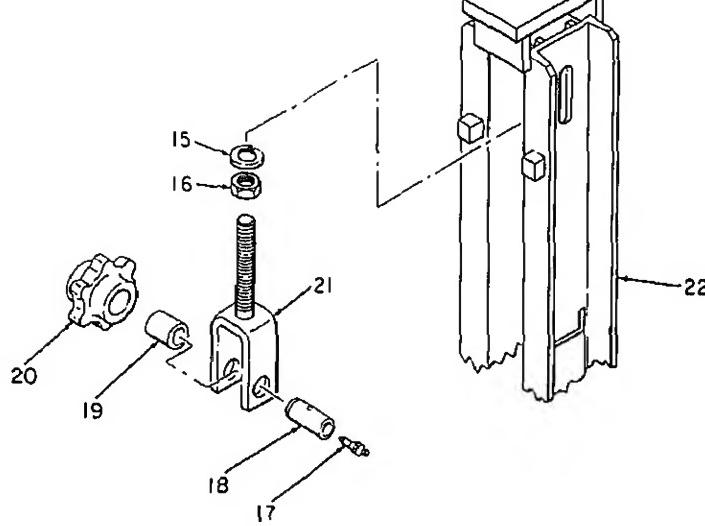
Install the complete drill mounting as described in paragraph 5-12b.



ut, square, 6/8-11 (2)
asher, lock, external tooth, 5/8 in. (2)

11 Link pin (2)
12 Drill mounting plate

Figure 6-6—Continued.



Foot piece pointer	16 Nut, jam, 3/4-10
Nut, self-locking hex, 3/4-10	17 Lubricating fitting
Washer, flat, 3/4 in.	18 Sprocket shaft
Spring	19 Tower sprocket bearing
Lubrication fitting	20 Tower sprocket
Sprocket shaft	21 Sprocket yoke
Tower sprocket bearing	22 Drill guide

Figure 6-7—Continued.

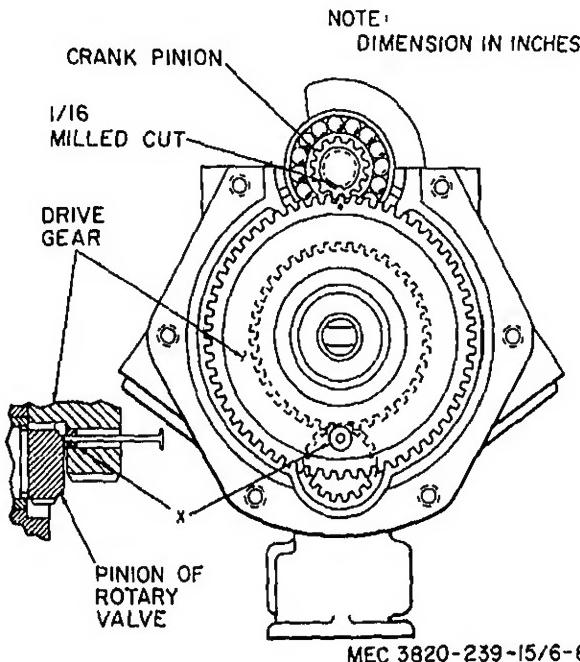


Figure 6-8. Air feed motor, valve timing details.

Section III. HYDRAULIC PUMP ASSEMBLY

15. General

This section contain repair instructions for hydraulic pump assembly. The assembly consists essentially of an air motor which drives hydraulic pump through a flexible coupling. The pump provides all of the hydraulic power to drive the hydraulic cylinders, which position boom and drill guide.

6-17. Disassembly

a. General. Disassemble hydraulic pump assembly in the numerical sequence as illustrated on figure 6-9. Note the following special procedures.

- (1) Rotate flexible coupling (14, figure 6-9) until setscrews (1) are visible. Loosen both setscrews.
- (2) Remove screws (10), nuts (11), and

b. Hydraulic Pump. Disassemble hydraulic pump in the numerical sequence as illustrated on figure 6-10. Note the following special procedures:

- (1) Mark the position of cover (2, fig. 6-10) with respect to body (17) before removal, so that the parts will be assembled with the proper orientation.
- (2) Pull pressure plate (4), spring (3), pins (5), ring (7), and rotor (8) off drive shaft (16).

Note. Mark the position of ring (7) and pins (5) to facilitate assembly.

- (3) Remove and discard O-rings (6).
- (4) Remove snap ring (10). Using a mallet, tap on the end of drive shaft (16), to free the shaft with assembled parts from body (17).

Note. Bearings (11 and 13), seal (14), and spacer (15) are press-fitted on drive shaft (16).

- (5) Using a suitable bearing puller, remove bearing (11) from drive shaft (16).
- (6) Remove bearing (13) from body (17) by tapping it out with a drift punch.

Note. Do not remove seal (14) from drive shaft (16) unless it is damaged. The seal must be replaced once it is removed.

- (7) If required, tap key (12) out of the slot in drive shaft (16).

c. Air Motor. Disassemble air motor in the numerical sequence as illustrated on figure 6-11. Note the following special procedures:

- (1) After removing housing cover (4, fig. 6-11), loosen the motor in the housing by tapping the end of motor pinion (14) with a mallet. Remove the assembled parts from motor housing (19).
- (2) Hold the assembly in an upright position by clamping motor pinion (14)

- drive on the end of the rotor (15) is freed from bearing, rear end plate bearing spacer (11), and vanes (18) from (5) Support front end plate closely as possible to center of rotor (15), and end of motor pinion (14) ball bearing (16) and plate are freed.
- (6) Only if replacement of pinion (14) or rotor (15) is required, support the front face insert a steel rod perpendicular to the bore of the rotor. rod until the motor pinion is freed.

6-18. Cleaning

Clean all parts with an appropriate solvent and blow dry with compressed air.

Caution: Do not spin ball bearings with compressed air.

6-19. Inspection and Repair

a. Inspect bearings (11 and 13, fig. 6-11) and 9 and 16, fig. 6-11) for damage, roughness and binding while Replace bearings if these defects are found.

b. Inspect vanes (9, fig. 6-11) for chips and wear. If an inspection indicates replacement, use a complete set of vanes. Replace if hydraulic pump or 5 for the air motor.

c. Inspect rotors (8, fig. 6-11) for cracks, scores, and rough spots. Remove rough spots and score piece of emery cloth. Replace if rotor is damaged.

d. Inspect cylinder (12, fig. 6-11) for cracks, nicks, and burrs on the face. Check that the bore is smooth. Remove slight nicks and burrs using hand file. Polish the bore with

e. Inspect housings and covers for cracks, nicks and burrs on machined surfaces, and for stripped and crossed threads. Remove nicks and burrs with a fine file or handstone. Retap or rechase damaged threads.

f. Inspect gaskets (5 and 18, fig. 6-11). Replace if worn, frayed, or otherwise damaged. Replace O-rings (6, fig. 6-10) regardless of condition.

g. Inspect all hardware for damaged threads. Retap or rechase all stripped and crossed threads. Replace if unserviceable.

h. Inspect end plates (10 and 17, fig. 6-11) for scratches or score marks on the faces. Remove slight damage by rubbing the plate on a piece of emery cloth placed on a smooth flat surface. If plates are badly scored or scratched, replace them.

20. Reassembly

a. *Air Motor.* Reassemble air motor by carefully following the step-by-step procedure given below:

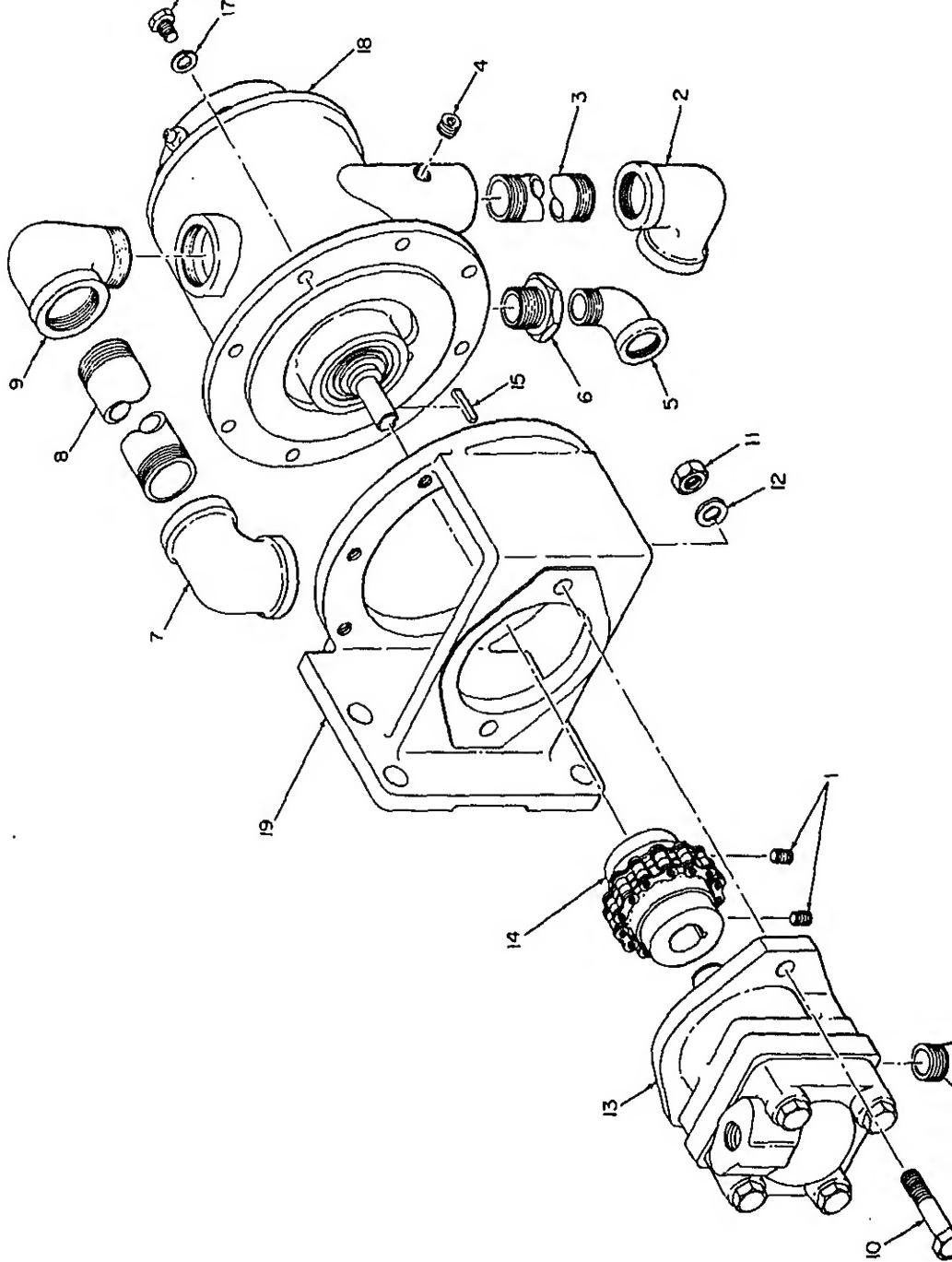
- (1) Place front end plate (17, fig. 6-11) on the bed of an arbor press. Start front ball bearing (16) squarely into the recess in the plate. Using the arbor press to bear only on the outer race of the bearing, press it in until seated.
- (2) Stand rotor (15) on the arbor press. Using the press to bear only on the inner race of front ball bearing (16), press the bearing and end plate onto the rotor.

Caution: Do not allow the end plate to bind against the rotor.

- (3) If motor pinion (14) was removed from rotor (15), align the serrations in the pinion shank with the rotor and press the pinion in up to the

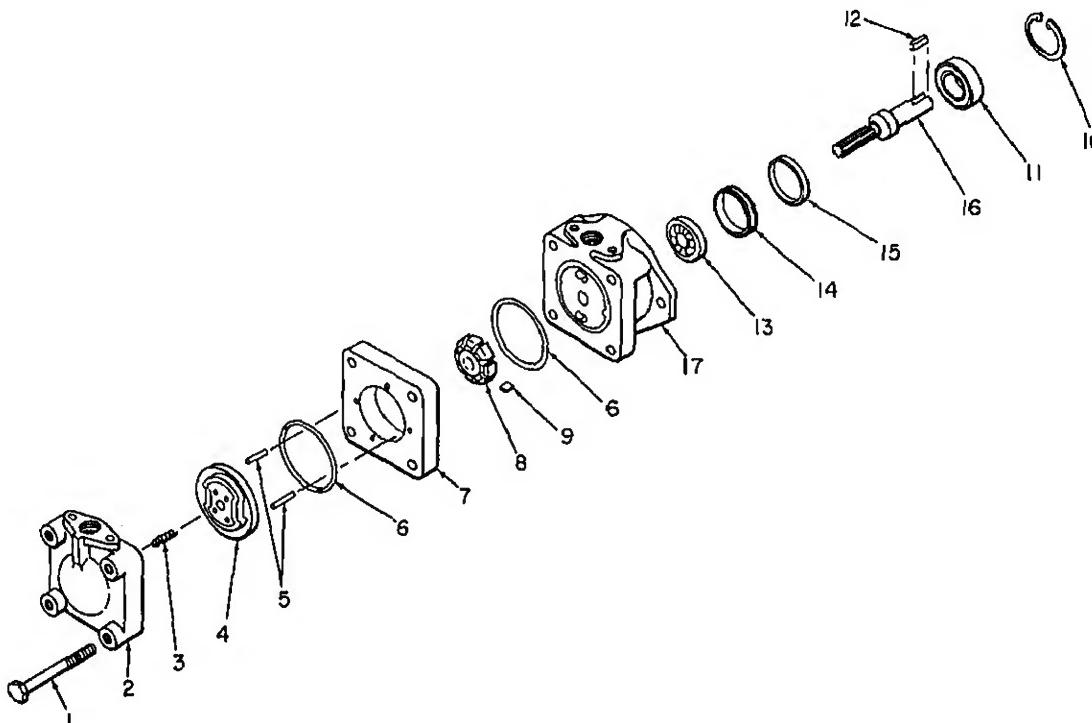
Make sure that the cylinder installed correctly (when facing the air port in the cylinder, the dowel hole is to be to the right of the air port). Reverse the cylinder position if necessary.

- (6) Install rotor bearing spacer (11, chamfered side first) on shaft of rotor (15).
- (7) Install rear ball bearing (9) (chamfered side first) in rear end plate (4) in the same manner as step (1).
- (8) Stand rotor (15) with assembled parts on the bed of an arbor press. Position rear end plate (10), bearing side up, over the rotor, and using the arbor press to bear only on the bearing inner race, press the rear end plate on until the bearing contacts rotor bearing spacer (11).
- (9) Install rotor bearing spring (7) over rear ball bearing (9) so that the spring prongs contact the bearing outer race.
- (10) Install the left-hand threaded rod lock screw securely.
- (11) Install air port gasket (18), lap open end first, into the air inlet slot of motor housing (19) (fig. 6-11).
- (12) Align the dowel holes in rear end plate (10) and front end plate (17) with those in cylinder (12), and insert a 1/4-inch diameter rod at least 1 1/2 inches long, into the dowel holes, allowing the rod to protrude from the front end plate.
- (13) Insert the rod into the dowel hole in motor housing (19) and slide the assembled motor parts into the housing. If necessary, tap the flanged face of the motor housing with a mallet to securely seat the motor assembly.
- (14) Remove the rod and install cylinder



- Street elbow, $90^\circ \times 1\frac{1}{2}$ in. (2)
 Reducing bushing, $3/4$ to $1/2$ in.
 Elbow, $90^\circ \times 1$ in.
 Nipple, 1×6 in.
 Street elbow, $90^\circ \times 1$ in.
 Screw, cap, hex-hd, $3/8-16 \times 1\frac{1}{2}$ in. (2)
- 15 Square key, $1/8 \times 3/4$ in.
 16 Screw, cap, hex-hd, $5/16-18 \times 7/8$ in. (8)
 17 Washer, lock, $5/16$ in. (8)
 18 Air motor
 19 Pump mounting housing

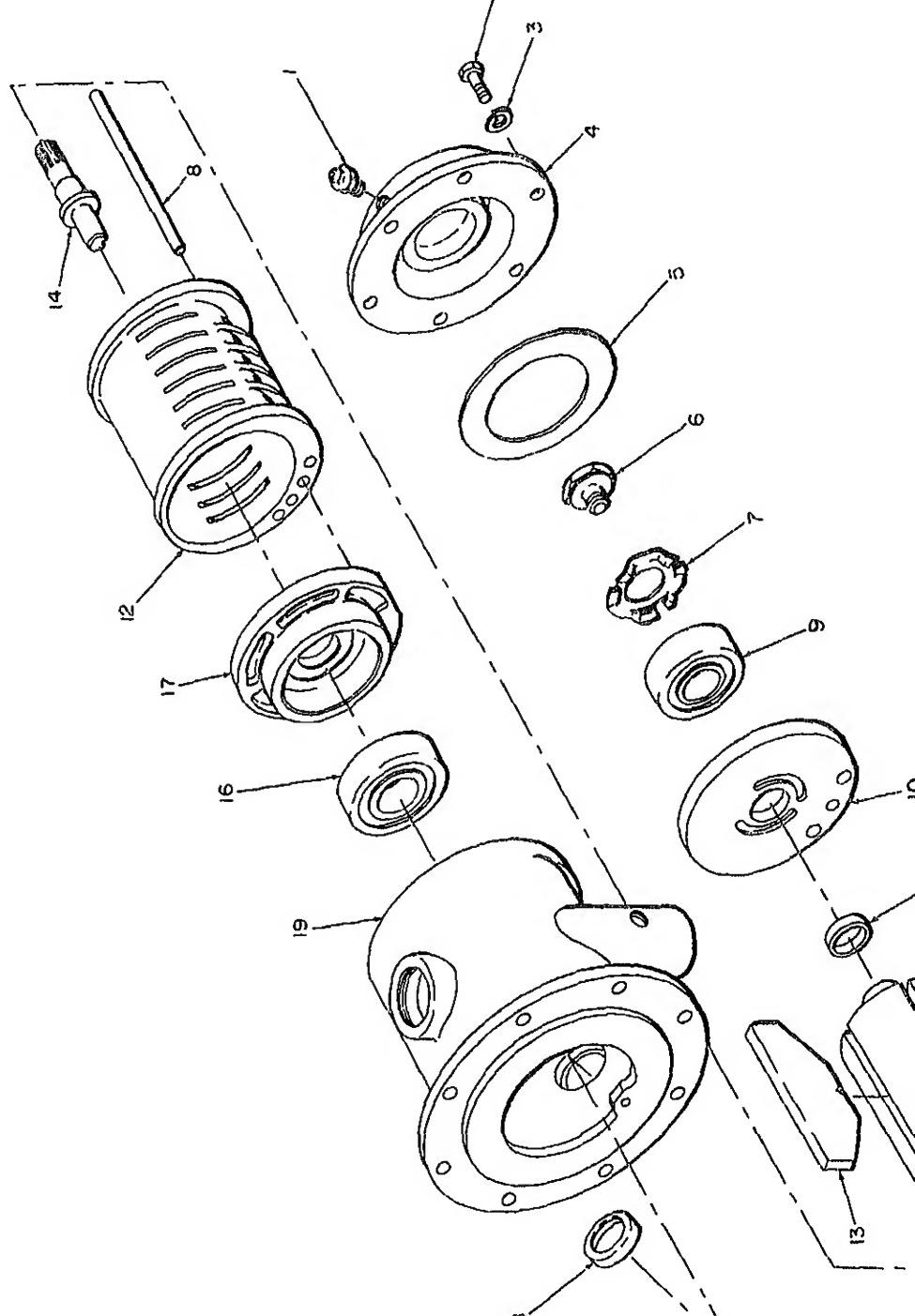
Figure 6-9—Continued.



MEC 3820-239-15/6

- | | |
|---|----------------|
| Screw, hex-hd, $8/8-16 \times 2\frac{1}{4}$ in. (4) | 10 Snap ring |
| Cover | 11 Bearing |
| Spring | 12 Key |
| Pressure plate | 13 Bearing |
| Pin (2) | 14 Seal |
| O-ring (2) | 15 Spacer |
| Ring | 16 Drive shaft |
| Rotor | 17 Body |
| Vane (12) | |

Figure 6-10. Hydraulic pump, exploded view.



Plastic fitting, 1/8 in.	8	Cylinder dowel
Hex cap, hex-hd 1/4-20 x 3/4 in. (6)	9	Rear ball bearing
Washer, lock, 1/4 in. (6)	10	Rear end plate
Motor housing cover gasket	11	Rotor bearing spacer
Motor lock screw	12	Cylinder
Motor bearing spring	13	Vane (5)
	14	Motor pinion

Figure 6-11—Continued.

15 Rotor
 16 Front ball bearing
 17 Front end plate
 18 Air port gasket
 19 Motor housing

pump by carefully following the step-by-step procedure given below:

- (1) Before assembling, dip all parts in clean hydraulic oil. This will facilitate assembly, and provide adequate initial lubrication.
- (2) Using a suitable bearing pusher to bear on the inner race of bearing (11, fig. 6-10), install the bearing on drive shaft (16).
- (3) Using a suitable bearing pusher to bear on the outer race of bearing (13), install the bearing in body (17).
- (4) Install spacer (15), seal (14), and key (12) on drive shaft (16).

Note. Make sure the seal is installed with the sealing lip facing the key end of the shaft, to prevent the entry of air into the system.

- (5) Slide the assembled drive shaft (16) into body (17) until seated in bearing (13). Tap the drive shaft lightly with a mallet if necessary, to seat the parts.
- (6) Using retaining ring pliers, install snap ring (10).
- (7) Insert an O-ring (6) in the groove of body (17) and cover (2). Make sure the O-rings are seated properly to prevent leakage.
- (8) Install ring (7) in the proper position as marked during disassembly, and secure with pins (5).

- (11) Install cover (2) in the position as marked during assembly and tighten screws (1) 22 to 28 foot-pound.

Note. Check that the pump is leak-free by hand. If the pump is leaking, disassemble and determine the cause.

c. Hydraulic Pump Assembly

Install the hydraulic pump assembly in reverse sequence as illustrated on figure 6-9, using the following special procedure:

- (1) After securing air line (1) (fig. 6-9) to pump main line (19), loosen setscrew (11) on coupling (14). Make sure the lock key (15) is installed in the keyway of the motor shaft, and slide the coupling onto the shaft. Tighten the setscrew (11).
- (2) Make sure that key (15) on pump (13) is installed in the keyway of coupling (14). Install screw (11), and lock washer (15). Tighten the setscrew (11) to hold the pump in place.
- (3) Install elbows and fittings as illustrated on figure 6-9.

6-21. Installation

Install the hydraulic pump as described in paragraph 8-44.

Section IV. HYDRAULIC VALVE ASSEMBLY

6-22. General

This section contains repair instructions for the hydraulic valve assembly. The hydraulic valve assembly contains the controls for operating the hydraulic cylinders to position the boom and the drill guide (fig. 1-5).

6-23. Removal

Remove the hydraulic valve assembly as described in paragraph 8-58.

6-24. Disassembly

a. Hydraulic Valve Assembly

Disassemble the hydraulic valve assembly in

valve in the numerical sequence as illustrated on figure 6-13.

Note. Label each valve section as the parts are removed, and do not intermix spools (16, fig. 6-13) since they are individually fitted to the bores.

6-25. Cleaning

Clean all parts in an approved solvent and blow dry with compressed air. Be sure to thoroughly clean out and dry all internal passages in body (20, fig. 6-13).

6-26. Inspection and Repair

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged

spacers.

d. Do not attempt to rework damage (16, fig. 6-13) as this will result in leakage and pressure loss.

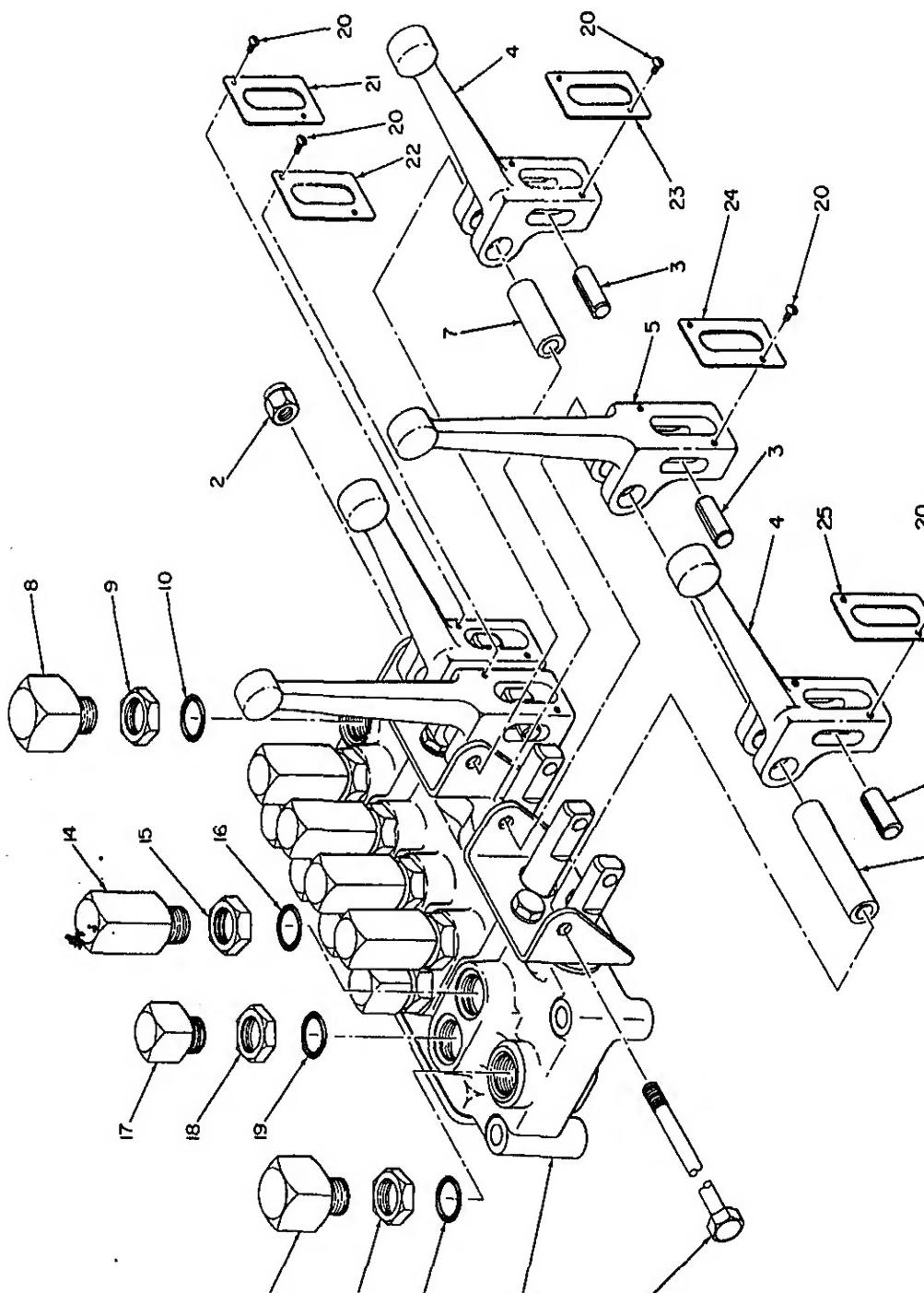
6-27. Reassembly

a. *Hydraulic Valve.* Reassemble hydraulic valve in reverse of numerical sequence illustrated on figure 6-13.

b. *Hydraulic Valve Assembly.* Reassemble hydraulic valve assembly in reverse of numerical sequence as illustrated on figure 6-13.

6-28. Installation

Install the hydraulic valve assembly as described in paragraph 3-59.



IR-locking, nec, 3/8-10

pin (5)

valve lever (3)

valve lever (2)

spacer bushing (2)

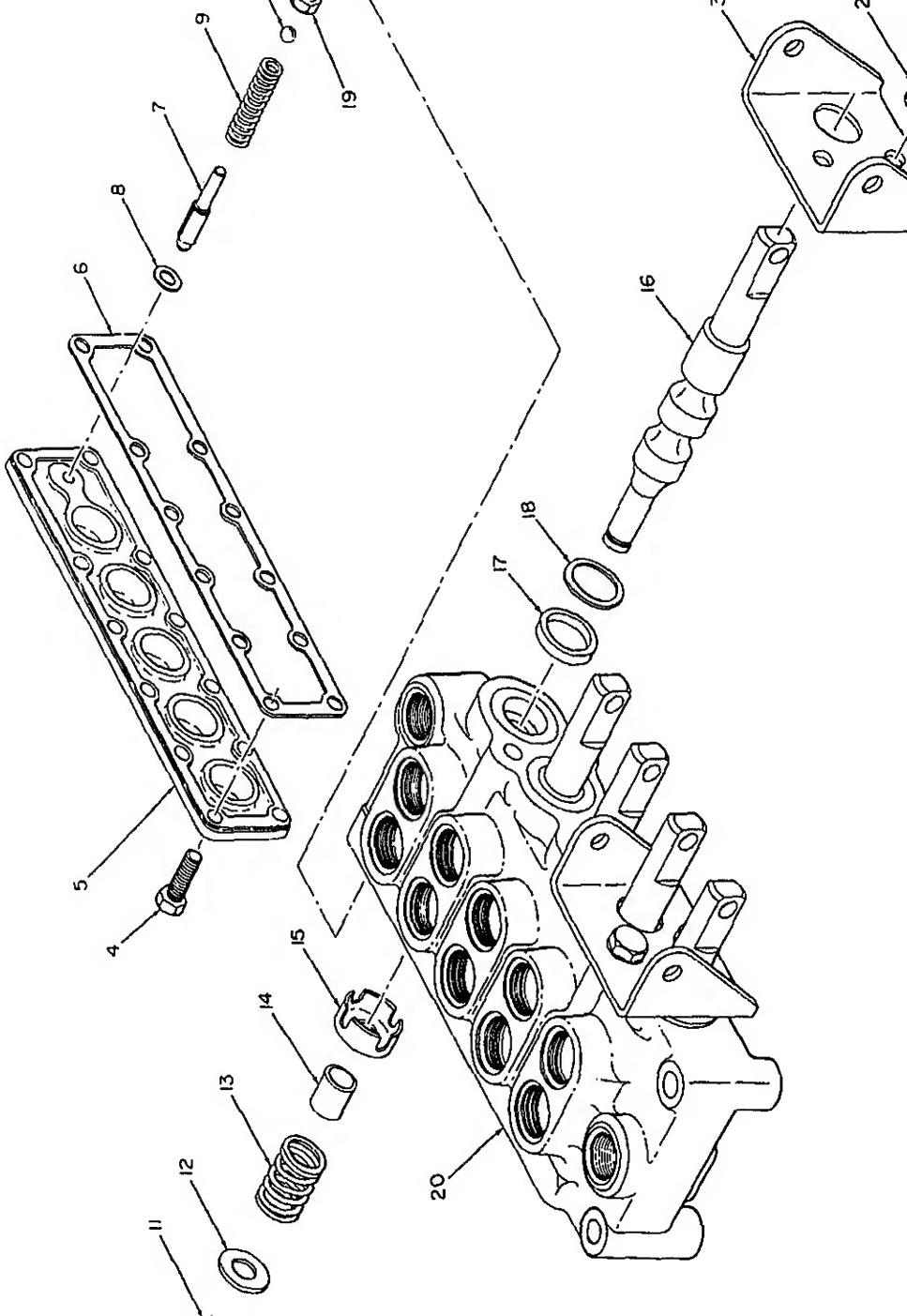
spacer bushing

fitting

nut

- 11 Boom lift nameplate
- 12 Lock nut
- 13 O-ring
- 14 Boss fitting (5)
- 15 Lock nut (5)
- 16 O-ring (5)
- 17 Boss fitting (5)
- 18 Lock nut (5)
- 21 Boom swing nameplate
- 22 Boom dump cylinder nameplate
- 23 Guide swing cylinder nameplate
- 24 Guide extension cylinder nameplate
- 25 Guide extension cylinder nameplate
- 26 Hydraulic valve

Figure 6-12—Continued.



1, cap, hex-hd, 3/8-16 x 5/8 in. (4)	8 Pressure adjusting shim (as rqr)
er, lock, 3/8 in. (4)	9 Relief spring
bracket (2)	10 Relief ball
, cap, hex-hd, 1/4-20 x 5/8 in. (12)	11 Retaining ring (5)
cover gasket	12 Spool washer (5)
pin	13 Spool return spring (5)
	14 Spool stop (5)
	15 Cup washer (5)
	16 Spool (5)
	17 V-ring packing (5)
	18 Back-up ring (5)
	19 Relief seat
	20 Body

Figure 6-13—Continued.

the main air valve and manifold lubricator. The main air valve is the on-off control for the air supply from the compressor. The manifold lubricator injects a preset quantity of rock drill oil into the air stream to provide lubrication for the air motors and drifter drill.

6-30. Removal

Remove the main air valve and manifold lubricator as described in paragraph 3-49.

6-31. Disassembly

a. *Main Air Valve.* Disassemble main air valve in the numerical sequence as illustrated on figure 6-14.

b. *Manifold Lubricator.* Disassemble manifold lubricator in the numerical sequence as illustrated on figure 6-15.

and blow dry with compressed air.

6-33. Inspection and Repair

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped crossed, or replace if unserviceable.

- c. Replace all O-rings.

6-34. Reassembly

a. *Main Air Valve.* Reassemble main air valve in reverse of numerical sequence as illustrated on figure 6-14.

b. *Manifold Lubricator.* Reassemble manifold lubricator in reverse of numerical sequence as illustrated on figure 6-15.

6-35. Installation

Install the main air valve and manifold lubricator as described in paragraph 3-50.

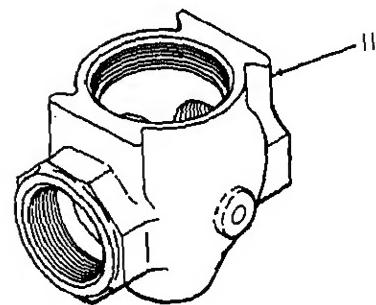
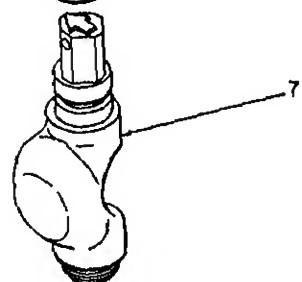
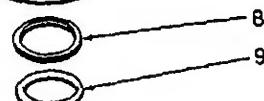
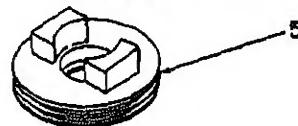
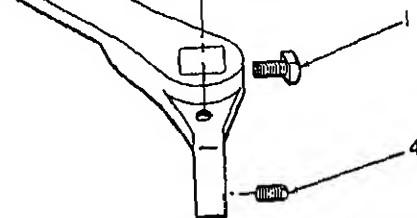
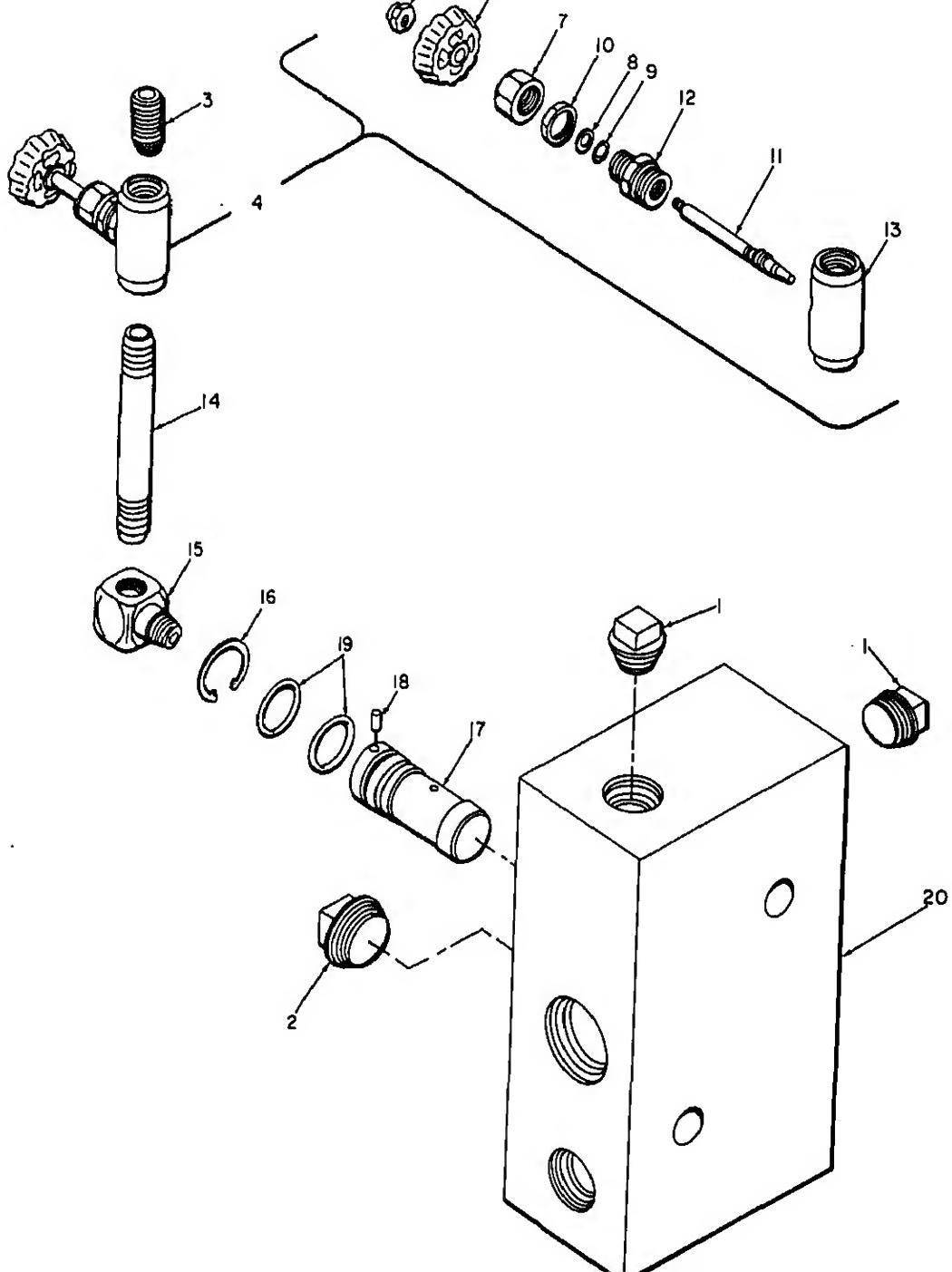


Figure 6-14—Continued.



4	Needle valve	14	Nipple
5	Acorn nut	15	Elbow
6	Handwheel	16	Retaining ring
7	Packing nut	17	Differential pressure nozzle
8	Packing washer	18	Dowel pln
9	O-ring	19	O-ring (2)
0	Mounting nut	20	Bare manifold lubricator

Figure 6-15—Continued.

Section VI. PROPELLING CONTROL VALVES

6-36. General

This section contains repair instructions for the propelling control valves. The propelling control valves supply air to the propelling air motors to tram the pneumatic drill either forward or reverse. There are two valves used, one for each traction drive, and quantities specified throughout this section are for one valve.

6-37. Removal

Remove the propelling control valves as described in paragraph 8-61.

6-38. Disassembly

Disassemble propelling control valve in the numerical sequence as illustrated on figure 6-16.

6-39. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-40. Inspection and Repair

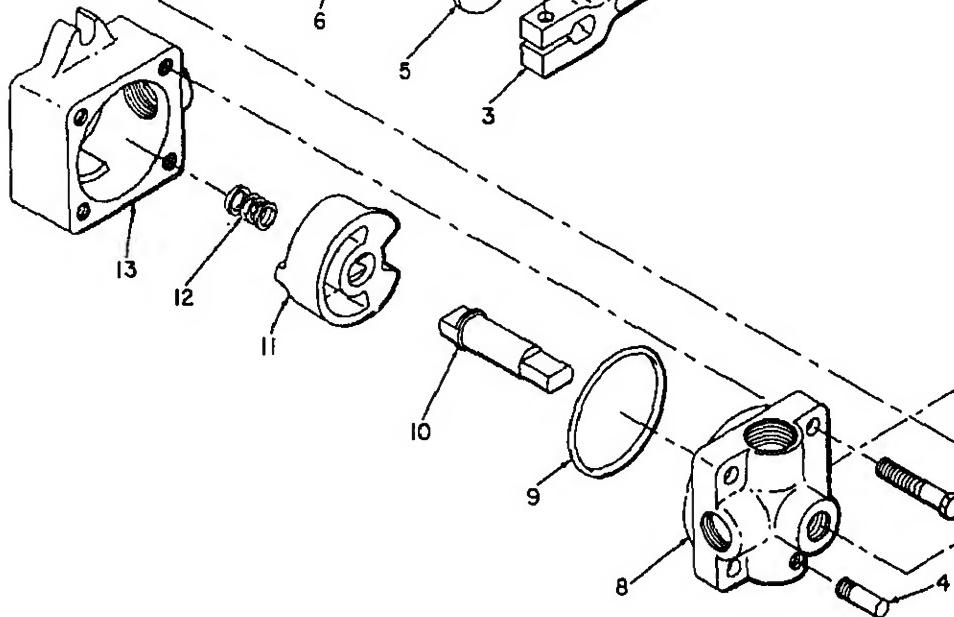
- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed or replace if unserviceable.
- c. Note that disc (11) and body (8) are matched parts and may not be replaced individually.
- d. Replace O-ring (9).

6-41. Reassembly

Reassemble propelling control valve in reverse of numerical sequence as illustrated on figure 6-16.

6-42. Installation

Install the propelling control valves as described in paragraph 8-62.



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- 1 Lubrication fitting, 1/8 in.
- 2 Screw, cap, hex-hd, 5/16-18 x 7/8 in.
- 3 Lever
- 4 Spring stop pin
- 5 Washer, flat, 21/32 ID x 2 OD x 1/8 in. thk
- 6 Lever spring
- 7 Screw, cap, hex-hd, 1/2-18 x 1 1/2 in. (4)

- 8 Body
- 9 O-ring
- 10 Spindle
- 11 Disc
- 12 Disc spring
- 13 Cap

Figure 6-16. Propelling control valve, exploded view.

Section VII. RETURN LINE OIL FILTER AND THROTTLE VALVE

6-43. General

This section contains repair instructions for the return line oil filter and throttle valve. The return line oil filter filters the hydraulic fluid before it returns to the hydraulic reservoir (fig. 1-5). The throttle valve is the on-off control for the hydraulic pump assembly, which furnishes the hydraulic power to position the booms and drill guide (fig. 1-5).

6-44. Removal

b. *Throttle Valve.* To remove the throttle valve, disconnect fittings (fig. 1-5) and remove the throttle valve from the mounting bracket.

6-45. Disassembly

a. *Return Line Oil Filter.* Remove the return line oil filter in the same manner as illustrated on figure 6-17. Remove the filter element (5, fig. 6-17) and gasket (6).

clean all parts with an approved solvent, and dry with compressed air.

7. Inspection and Repair

Inspect all parts for wear and damage. Inspect all hardware for damaged heads. Retap or rechase threads if stripped crossed, or replace if unserviceable.

8. Reassembly

Return Line Oil Filter. Reassemble return oil filter in reverse of numerical sequence illustrated on figure 6-17. Tighten body

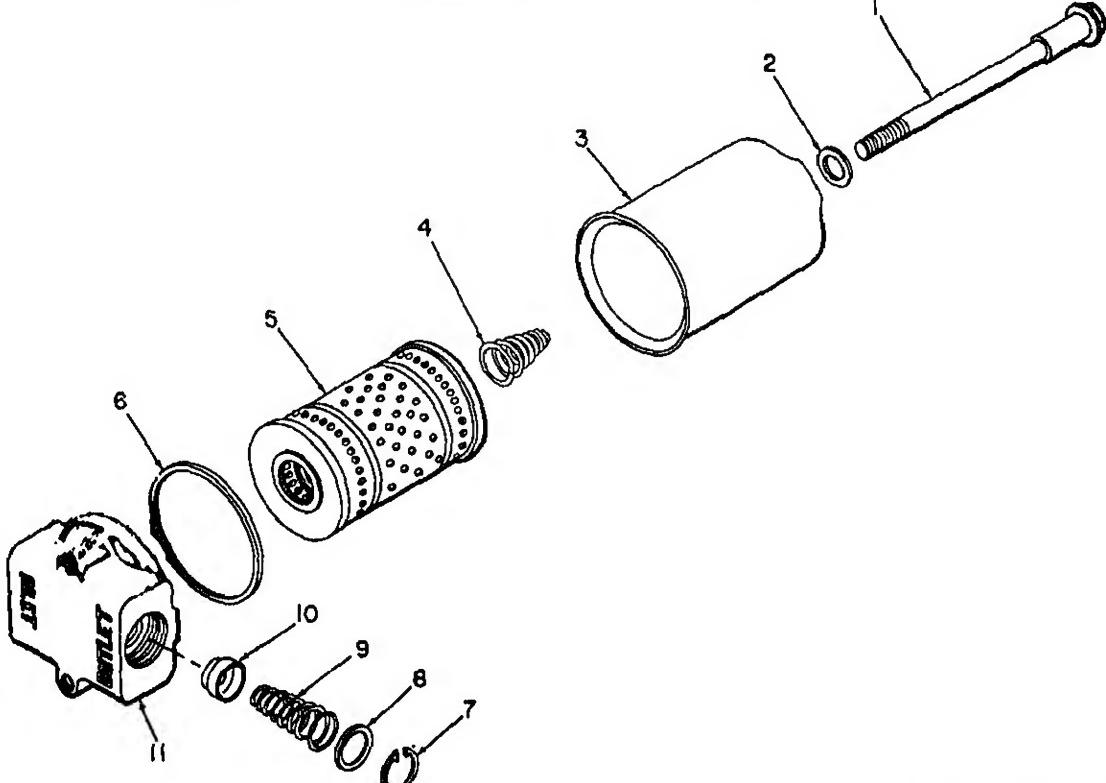
feet-pound.

b. Throttle Valve. Reassemble throttle in reverse of numerical sequence as illustrated on figure 6-18.

6-49. Installation

a. Return Line Oil Filter. See figure 1-5 and connect the return line oil filter in the line the hydraulic reservoir in the boom base assembly.

b. Throttle Valve. Mount the throttle valve on the nipple of the hydraulic valve mount bracket. See figure 1-5 and connect the throttle valve fittings.



Body bolt, hex-hd

Washer, flat

Filter body

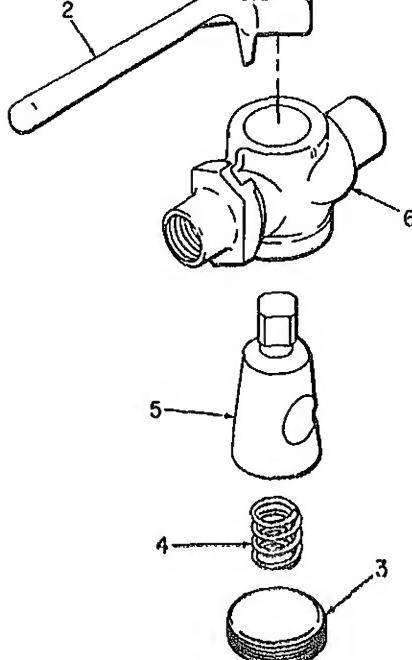
Spring

7 Retaining ring

8 Washer, flat

9 Spring

10 Poppet



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1 Spring pin, 5/32 dia x 1 3/16 in. 3 Plug
 2 Handle 4 Spring

5 Stem
 6 Valve body

Figure 6-18. Throttle valve, exploded view.

Section VIII. POWER DUMP AND SWING ASSEMBLY

6-50. General

This section contains repair instructions for the power dump and swing assembly. This assembly consists essentially of a dump cylinder and a swing cylinder, which hydraulically position the drill guide at the desired drilling angle in response to commands from the hydraulic valve assembly (fig. 1-5).

6-51. Removal

Remove the power dump and swing assembly as described in paragraph 5-14a.

6-52. Disassembly

in the numerical sequence as figure 6-19.

b. *Dump Cylinder.* Disassemble cylinder in the numerical sequence on figure 6-20. Note the following procedures:

- (1) Using a suitable spanner, remove screw retainer ring (8) and slide piston rod assembly with all parts attached, from cylinder assembly (23).
- (2) Remove lock nut (9), and parts off piston rod assembly.

re 6-21. Note the following special
res:

Pry snap ring (20, fig. 6-21) out of
the groove in cylinder head (13).

Using a suitable spanner wrench,
unscrew cylinder head (18), and slide
piston rod assembly (21) with all
parts attached, out of barrel assembly
(22).

Note. The cylinder head cannot be re-
moved when unscrewed, since it will not
fit over the fitting of the piston rod.

Remove lock nut (8), and take all
parts off piston rod assembly (21)
from the nut end of the rod.

After sliding cylinder head (18) off
piston rod assembly (21), remove
the parts (15 through 19) from the
cylinder head.

Discard all O-rings.

Clean all parts with an approved solvent
and blow dry with compressed air.

6-54. Inspection and Repair

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damage
threads. Retap or rechase threads if stripped
or crossed, or replace if unserviceable.

6-55. Reassembly

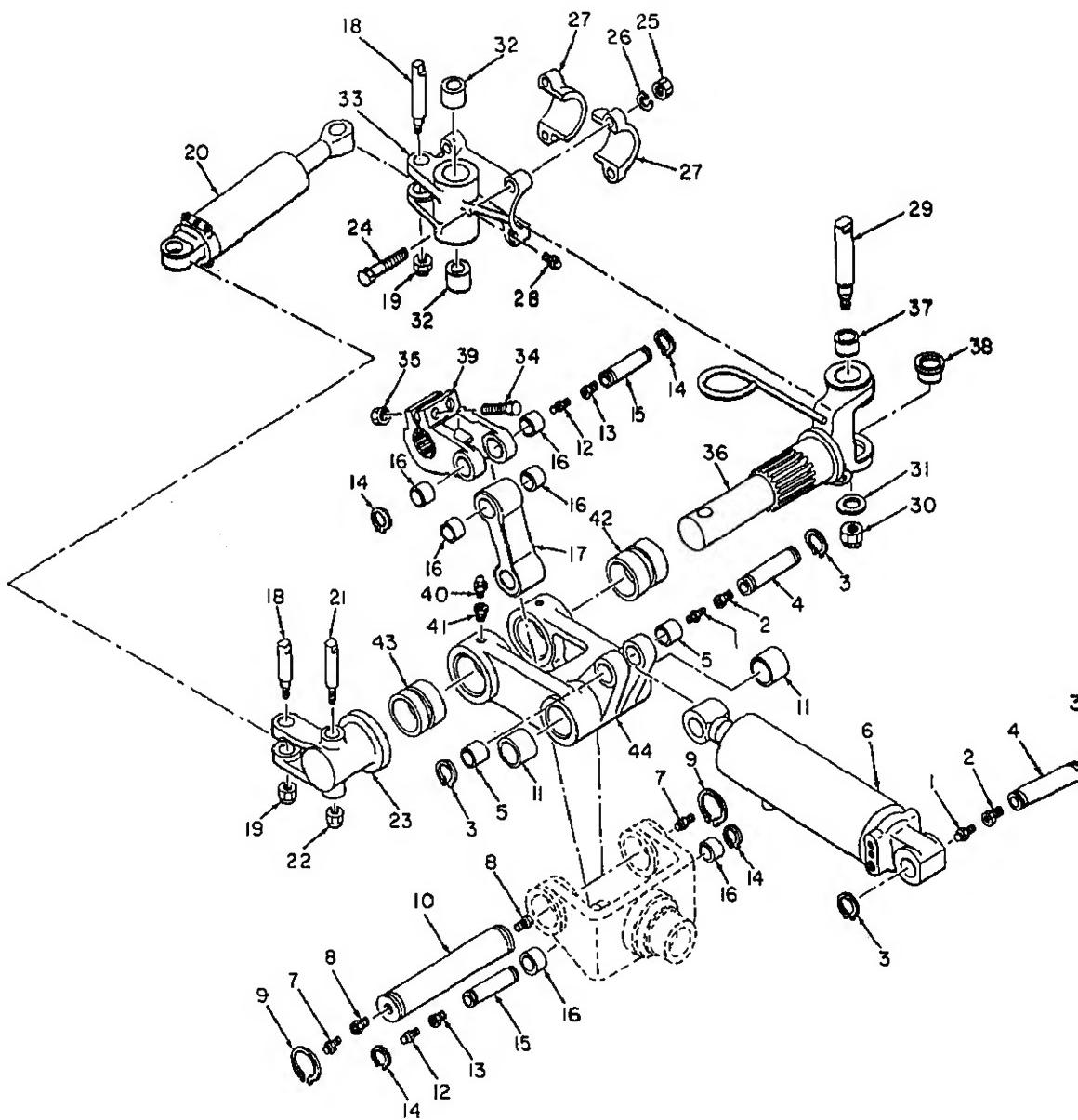
a. *Swing Cylinder.* Reassemble swing cy-
inder in reverse of numerical sequence as
illustrated on figure 6-21.

b. *Dump Cylinder.* Reassemble dump cy-
linder in reverse of numerical sequence as
illustrated on figure 6-20.

c. *Power Dump and Swing Assembly.* Re-
assemble power dump and swing assembly in
reverse of numerical sequence as illustrated on
figure 6-19.

6-56. Installation

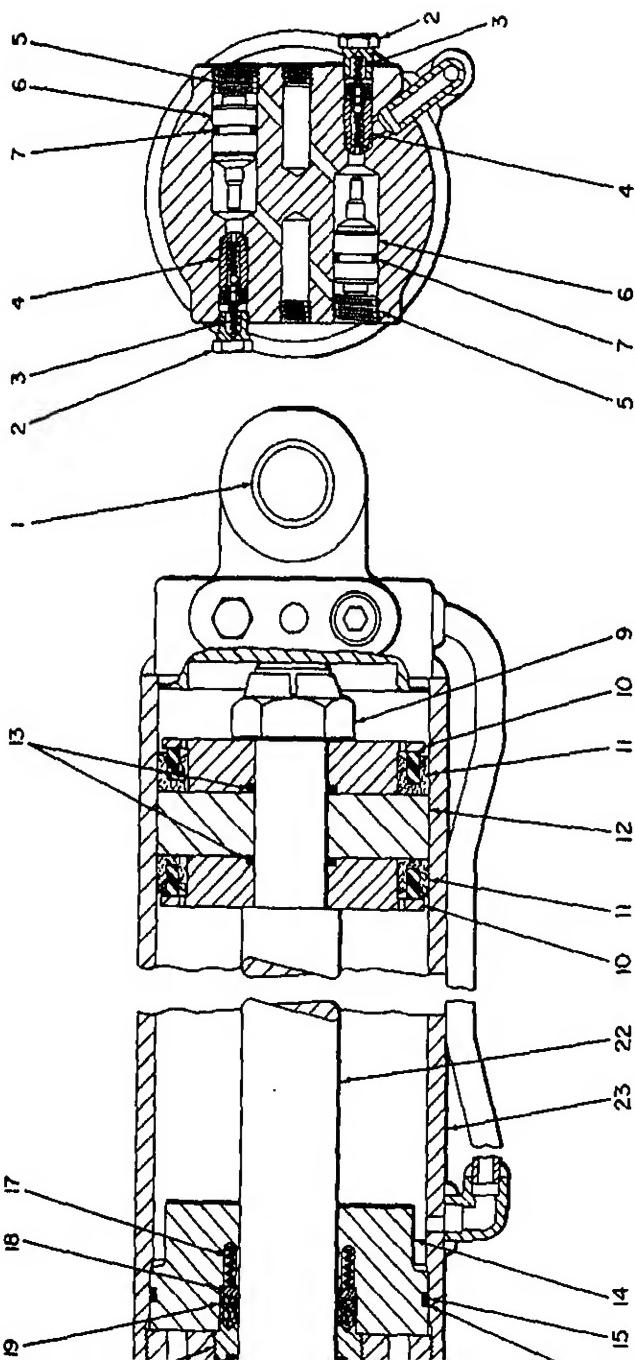
Install power dump and swing assembly as
described in paragraph 5-14b.



5	Dump link bushing (2)	26	Washer, lock, 7/8 in. (4)
6	Dump cylinder	27	Guide mounting swivel cap (2)
7	Lubrication fitting (2)	28	Lubrication fitting
8	Reducing bushing (2)	29	Guide mounting swivel bolt, 1 1/2- in.
9	Retaining ring (2)	30	Nut, self-locking hex, 1.1/2-12
10	Dump pivot pin	31	Washer, flat, 1 1/2 in.
11	Front boom bushing (2)	32	Guide mounting swivel bushing (2)
12	Lubrication fitting (2)	33	Guide mounting swivel
13	Reducing bushing (2)	34	Pinch bolt, sq-hd, 3/4-10 x 3 in. (2)
14	Retaining ring (4)	35	Nut, hex, 3/4-10 (2)
15	Dump pin (2)	36	Dump shaft assembly
16	Dump link bushing (6)	37	Dump shaft hinge bushing
17	Dump link	38	Dump shaft hinge bushing
18	Swing and dump cylinder bolt, 7/8-14 x 5 11/16 in. (2)	39	Dump clevis
19	Nut, self-locking hex, 7/8-14 (2)	40	Lubrication fitting
20	Swing cylinder	41	Reducing bushing
21	Swing clevis bolt, 7/8-14 x 7 1/8 in.	42	Dump shaft hinge bushing
22	Nut, self-locking hex, 7/8-14	43	Dump shaft bushing
		44	Dump arm

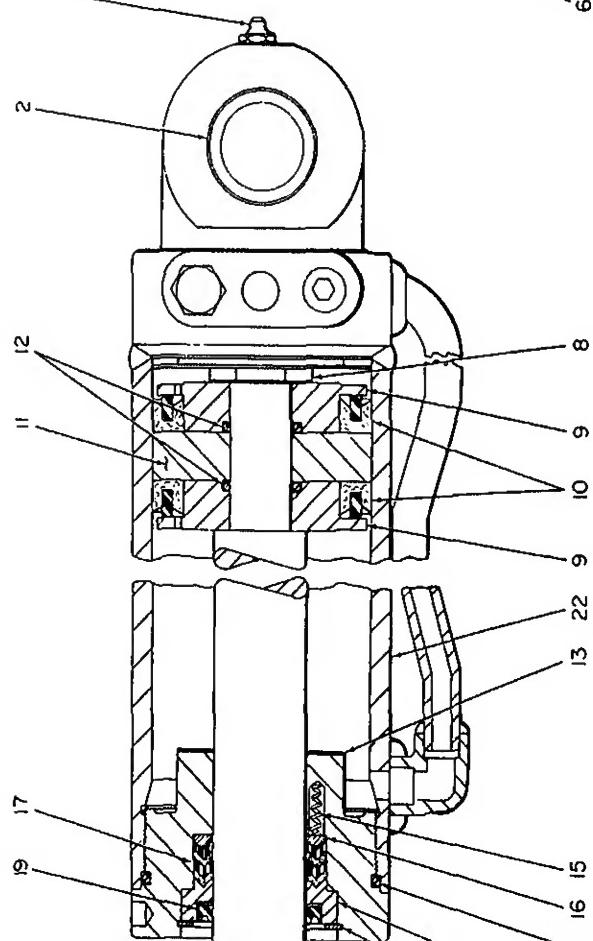
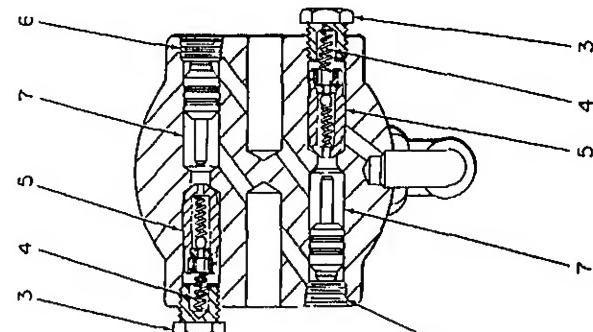
Figure 6-19—Continued.

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bushing	
hex-hd, 3/8 in. (2)	
	10 Backing plate (2)
relief poppet (2)	
	11 U-cup (2)
socket-hd, 3/4 in. (2)	
	12 Piston
	13 O-ring (2)
piston (2)	
	14 Cylinder head
ring (2)	
	15 O-ring
ring	
	16 Backup ring
	18 Male adapter
	19 V-packing (4)
	20 Gland nut
	21 Rod wiper
	22 Piston rod assembly
	23 Barrel assembly

Figure 6-20—Continued.



- on tubing (2)
cylinder bushing (2)
hex-hd, 3/8 in. (2)
relief poppet (2)
socket-hd, 3/8 in. (2)
sk piston (2)
hex, 1-14
- Backing plate (2)
U-cup (2)
Piston
O-ring (2)
Cylinder head
O-ring
Spring (3)
Male adapter
- V-packing (4)
Gland nut
Rod wiper
Snap ring
Piston rod assembly
Barrel assembly

Figure 6-21—Continued.

This section contains repair instructions for the power guide extension mounting. This assembly contains a hydraulic cylinder which moves the drill guide up and down in response to commands from the hydraulic valve assembly (fig. 1-5).

6-58. Removal

Remove the power guide extension mounting as described in paragraph 5-13a.

6-59. Disassembly

a. *Power Guide Extension Mounting.* Disassemble the power guide extension mounting in the numerical sequence as illustrated on figure 6-22.

b. *Drill Guide Extension Cylinder.* Disassemble drill guide extension cylinder in the numerical sequence as illustrated on figure 6-23. Note the following special procedures:

- (1) Pry snap ring (24, fig. 6-23) out of the groove in cylinder head (30).
- (2) Using a suitable spanner wrench, unscrew cylinder head (30), and slide piston rod assembly (23) with all parts attached, out of barrel assembly (32).
- (3) Straighten or cut lock pin (16), and take all parts off piston rod assembly (23) from the pin end of the rod.
- (4) After sliding cylinder head (30) off piston rod assembly (23), remove the

inder head.
(5) Discard all O-rings.

6-60. Cleaning

Clean all parts with an appropriate solvent and blow dry with compressed air.

6-61. Inspection and Repair

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for stripped threads. Retap or rechase threads if crossed, or replace if unserviceable.

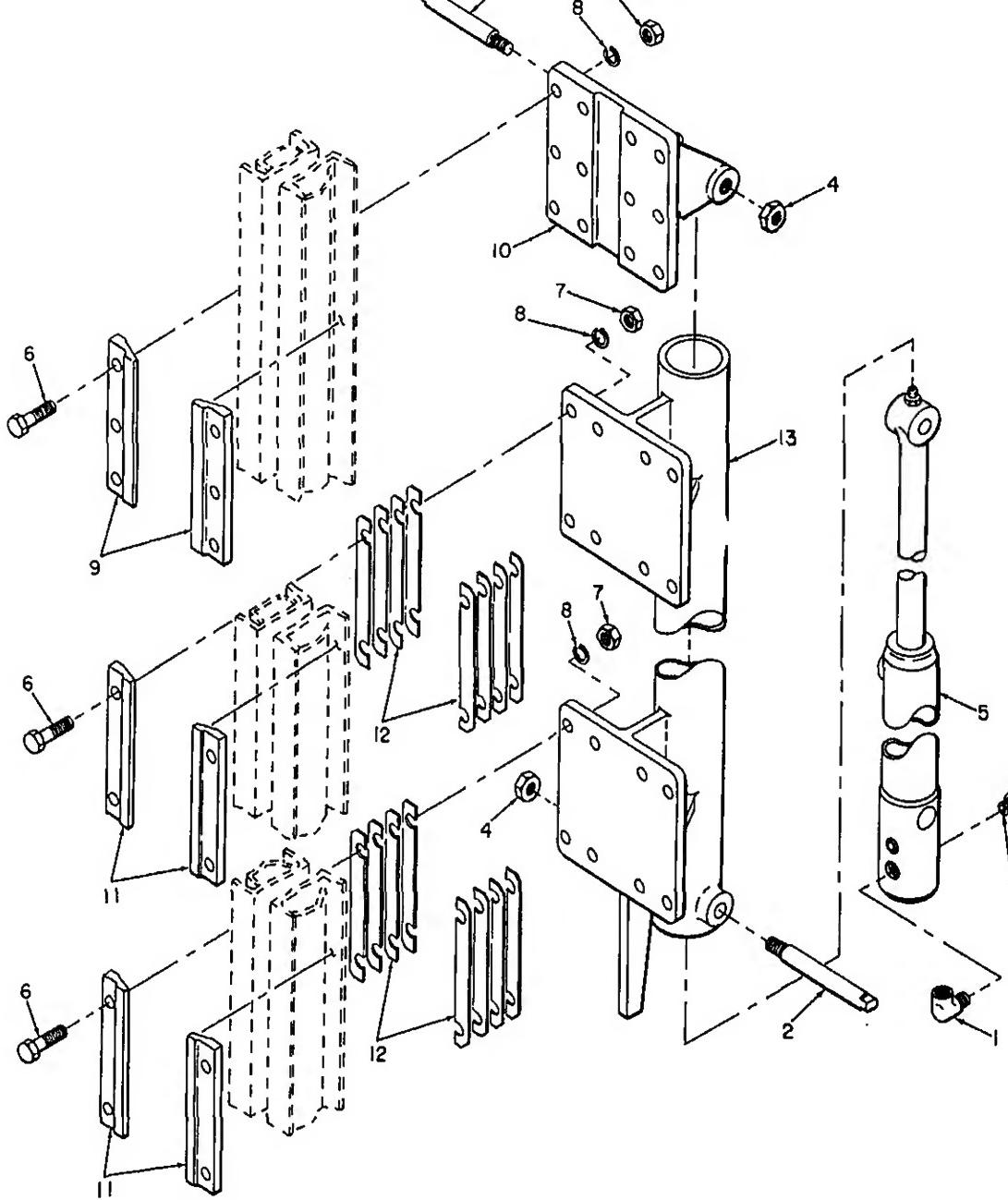
6-62. Reassembly

a. *Drill Guide Extension Cylinder.* Reassemble drill guide extension cylinder in the reverse of numerical sequence as illustrated on figure 6-23. After all parts are assembled, install piston rod assembly (23, fig. 6-23) onto lock pin (16) so that equal lengths exist on both sides of the rod, and flare the ends of the pin to retain it in position.

b. *Power Guide Extension Mounting.* Reassemble power guide extension mounting in the reverse of numerical sequence as illustrated on figure 6-22. Do not install clamp until ready to install the assembly.

6-63. Installation

Install the power guide extension mounting as described in paragraph 5-13b.



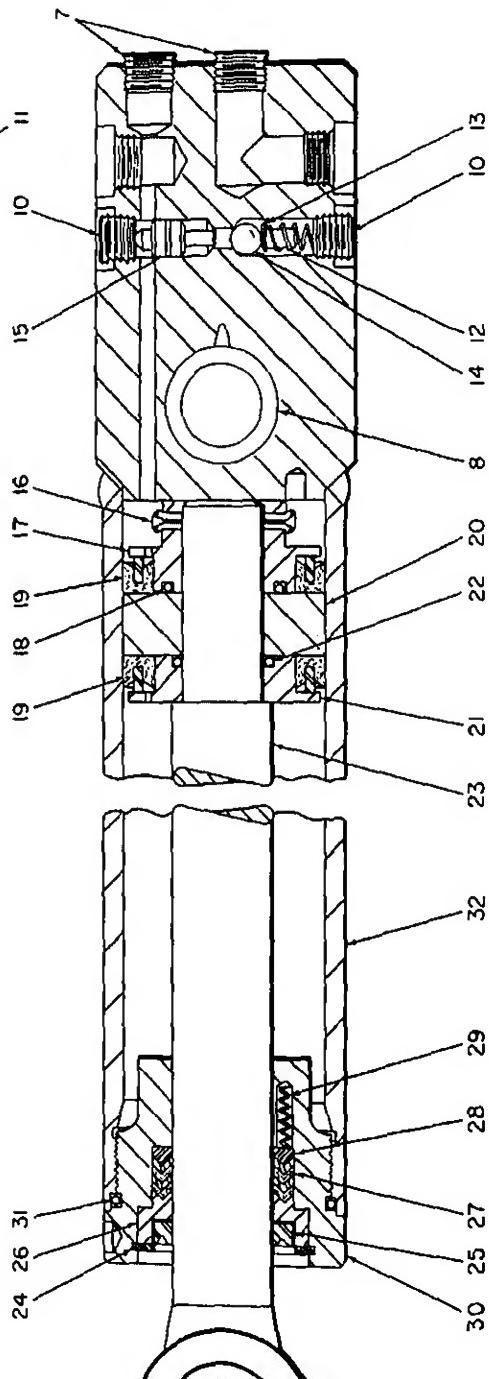
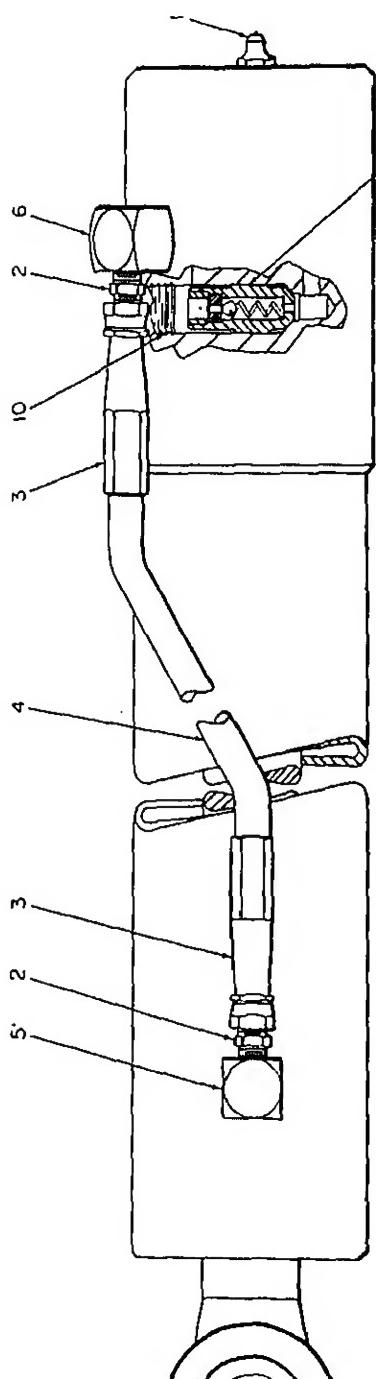
ex-hd, 5/8-11 x 2 1/4 in. (14)

x, 5/8-11 (14)

12 Clamp shims (16)

13 Drill guide mounting plate

Figure 6-22—Continued.



1	Lubrication fitting (2)
2	Adapter (2)
3	Swivel fitting (2)
4	Hose
5	Elbow
6	Elbow
7	Pipe plug, 8/8 in. (2)
8	Extension cylinder bushing
9	Extension cylinder rod bushing
10	Pipe plug (3)
11	Thermal relief poppet
13	Stop pin
14	Steel ball
15	Pilot piston
16	Lock pin
17	Backing plate
18	O-ring
19	U-cup (2)
20	Piston
21	Backing plate
22	O-ring
24	Snap ring
25	Rod wiper
26	Gland nut
27	V-packing
28	Male adapter
29	Spring (3)
30	Cylinder head
31	O-ring
32	Barrel assembly

Figure 6-29—Continued.

the hydraulic boom assembly. This assembly consists essentially of a boom swing cylinder and a boom lift cylinder, which hydraulically position the boom in response to commands from the hydraulic valve assembly (fig. 1-5).

6-65. Removal

Remove the hydraulic boom assembly as described in paragraph 5-15a.

6-66. Disassembly

a. *Hydraulic Boom Assembly.* Disassemble the hydraulic boom assembly in the numerical sequence as illustrated on figure 6-24.

b. *Boom Swing Cylinder.* Disassemble boom swing cylinder in the numerical sequence as illustrated on figure 6-25. Note the following special procedures:

- (1) Cut the lockwire and remove screws (10, fig. 6-25), gland nut (12), and rod wiper (11).

Note. The gland nut and rod wiper cannot be taken off completely since they will not fit over the rod fittings.

- (2) Unscrew cylinder head (13) and slide piston rod assembly (26) with all parts attached, out of barrel assembly (27).

- (3) Remove lock nut (19), and take all parts off piston rod assembly (26) from the nut end of the rod.

- (4) Discard all O-rings.

c. *Boom Lift Cylinder.* Disassemble boom lift cylinder in the numerical sequence as illustrated on figure 6-26. Note the following special procedures.

- (1) Cut the lockwire and remove screws (11, fig. 6-26), gland nut (18), and rod wiper (12).

- (2) Unscrew cylinder head (14) and slide piston rod assembly (27) with all parts attached, out of barrel assembly (28).
- (3) Remove lock nut (20), and take all parts off piston rod assembly (27) from the nut end of the rod.

- (4) Discard all O-rings.

6-67. Cleaning

Clean all parts with an approved solvent and blow dry with compressed air.

6-68. Inspection and Repair

a. Inspect all parts for wear and damage.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

6-69. Reassembly

a. *Boom Lift Cylinder.* Reassemble boom lift cylinder in reverse of numerical sequence as illustrated on figure 6-26.

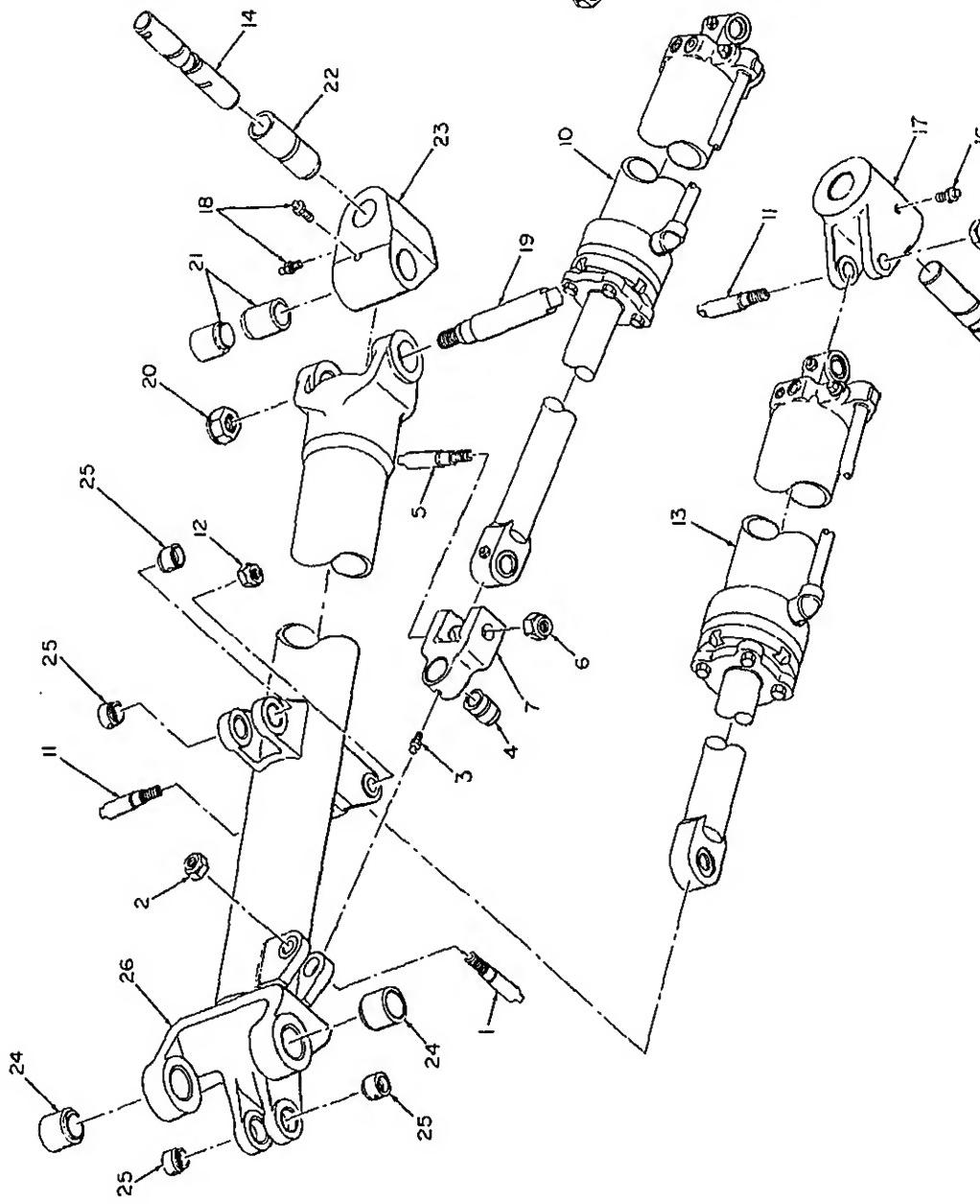
b. *Boom Swing Cylinder.* Reassemble boom swing cylinder in reverse of numerical sequence as illustrated on figure 6-25.

Note. Install lockwire through screws (11, fig. 26 and 10, fig. 6-25) to keep them tight.

c. *Hydraulic Boom Assembly.* Reassemble hydraulic boom assembly in reverse of numerical sequence as illustrated on figure 6-24.

6-70. Installation

Install the hydraulic boom assembly described in paragraph 5-15b.



- s bolt, 1-12 x 5 1/4 in.
 self-locking hex, 1-12
 Clevis bolt, 1-12 x 5 1/4 in. (2)
 Nut, self-locking hex, 1-12 (2)
 Self-locking fitting
 Cylinder bushing
 s bolt, 1-12 x 5 1/4 in.
 self-locking hex, 1-12
 Clevis bolt, 1-12 x 5 1/4 in.
 self-locking hex, 1-12
-
- 10 Boom swing cylinder
 11 Clevis bolt, 1-12 x 5 1/4 in. (2)
 12 Nut, self-locking hex, 1-12 (2)
 13 Boom lift cylinder
 14 Cylinder pedestal king pin (2)
 15 Boom swing cylinder pedestal pin
 16 Lubrication fitting (2)
 17 Cylinder pedestal (2)
 18 Lubrication fitting (2)

Figure N-24—Continued.

- 19 Boom pedestal pin
 20 Nut, self-locking hex, 1 1/2-12
 21 Boom pedestal bushing (2)
 22 Boom pedestal king pin bushing
 23 Boom pedestal
 24 Front boom bushing (2)
 25 Dump link bushing (4)
 26 Bare boom

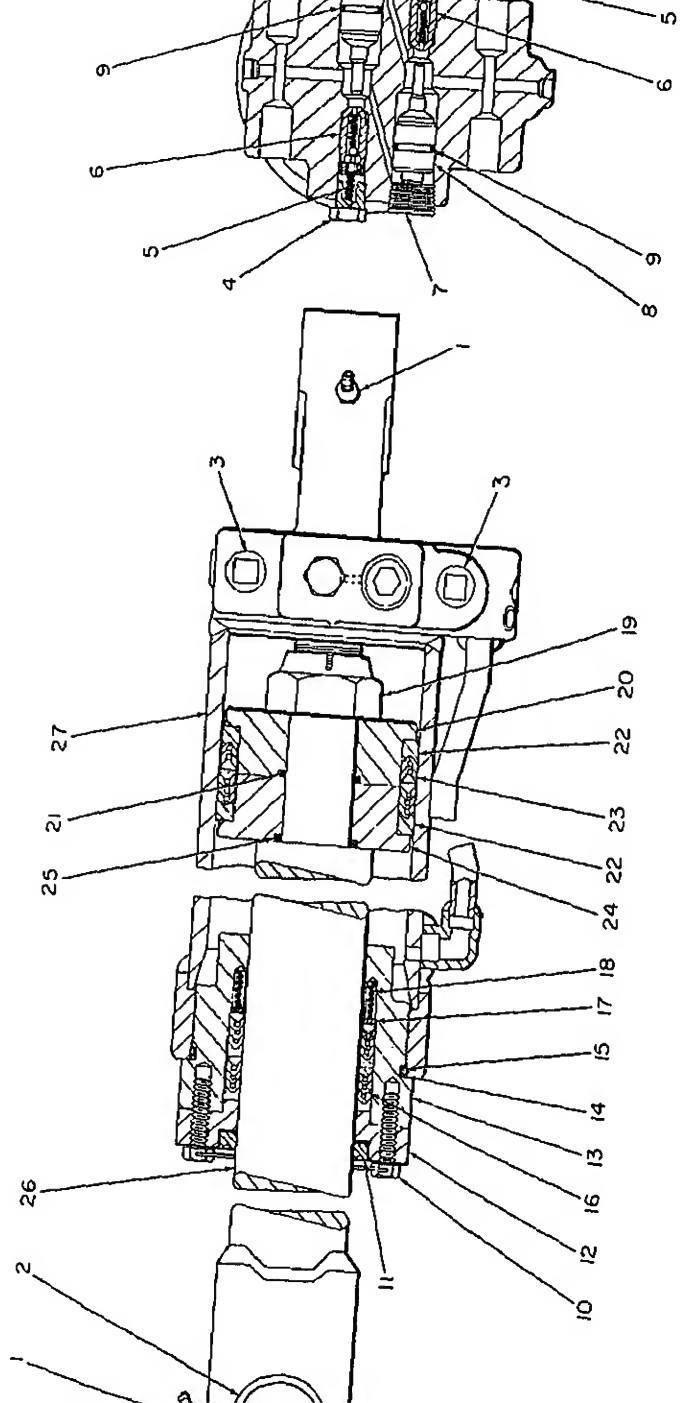
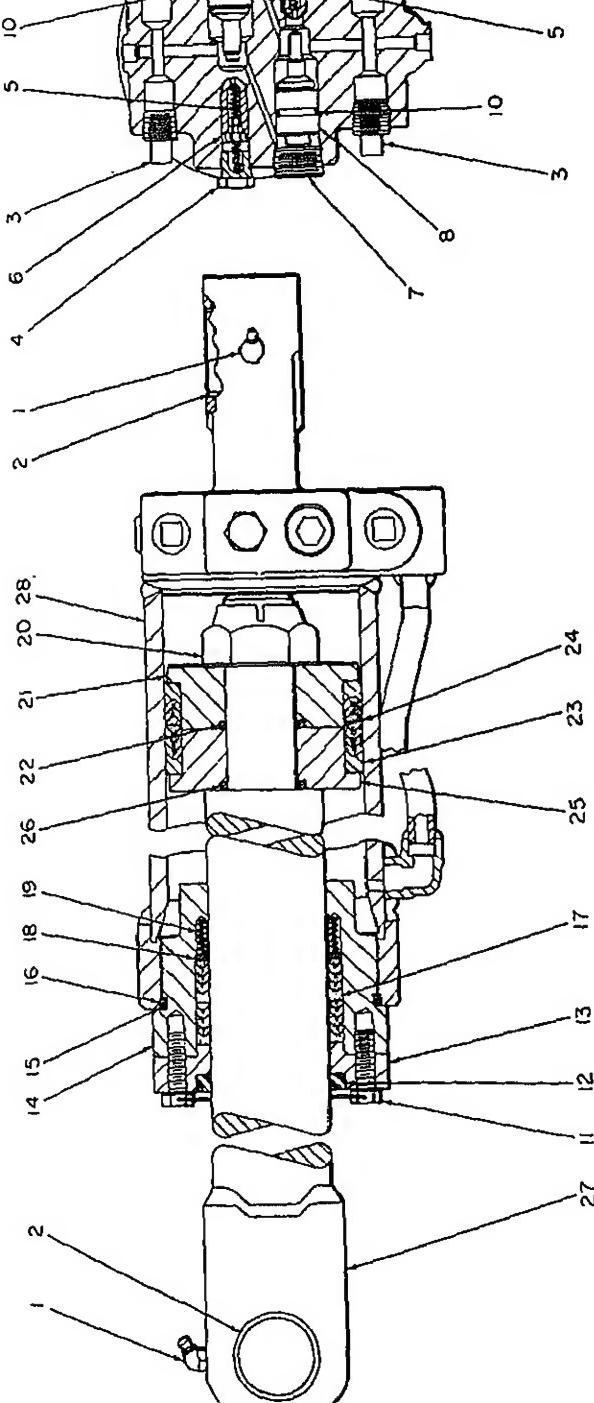


Figure 6-25. Boom steering cylinder.

- ation firing (2)
cylinder bushing (2)
plug, sq-hd, 1/2 in. (2)
plug, hex-hd, 3/8 in. (2)
(2)
al relief poppet (2)
ug, socket-hd, 3/4 in. (2)
heck piston (2)
ring (2)
- 10 Cap screw (4)
11 Rod wiper
12 Gland nut
13 Cylinder head
14 Backup ring
15 O-ring
16 Rod packing (2 sets)
17 Packing washer
18 Spring (6)
- 20 Rear backing plate
21 O-ring
22 Female adapter (2)
23 Piston packing
24 Front backing plate
25 O-ring
26 Piston rod assembly
27 Barrel assembly

Figure 6-25—Continued.



11	Cap screw (2)
12	Rod wiper
13	Gland nut
14	Cylinder head
15	Backup ring
16	O-ring
17	Rod packing (2 sets)
18	Packing washer
19	Spring (6)
20	Nut, lock, hex, 1 1/2-12
21	check piston
22	O-ring
23	Female adapter (2 rgr)
24	Piston packing
25	Front backing plate
26	O-ring
27	Piston rod assembly
28	Barrel assembly

Figure 6-26—Continued.

the boom base assembly. This assembly contains an integral hydraulic reservoir, and serves as the mounting pad for the hydraulic boom assembly, hydraulic pump assembly, and manifold lubricator.

6-72. Removal

Remove the boom base assembly as described in paragraph 5-16a.

6-73. Disassembly

Disassemble boom base assembly in the numerical sequence as illustrated on figure 6-27.

6-74. Cleaning

a. Clean all parts with an approved solvent, and blow dry with compressed air.

b. Flush the hydraulic reservoir to insure freedom from contamination.

b. Inspect all hardware for damage threads. Retap or rechase threads if stripped, or replace if unserviceable.

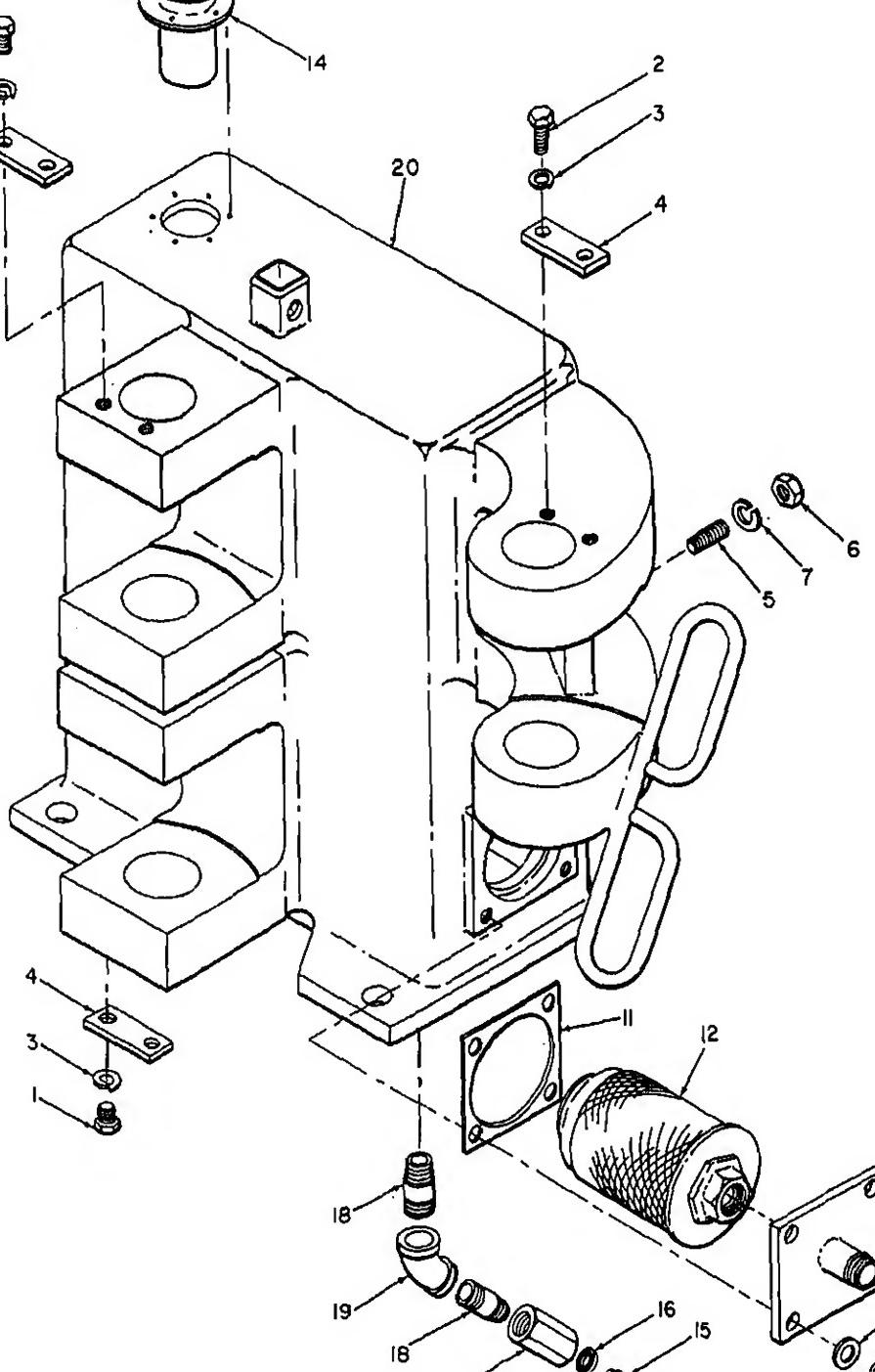
6-76. Reassembly

Reassemble boom base assembly in reverse of numerical sequence as illustrated on figure 6-27.

***Caution:** Cleanliness of the hydraulic reservoir is of the utmost importance. Any contamination entering this closed system will cause erratic boom operation and accelerated wear on parts.*

6-77. Installation

Install the boom base assembly as described in paragraph 5-16b.



8	Screw, hexhd, 1/2-13 x 1 in. (4)	9	Washer, flat 3/8 in. (4)
10	Screw, hexhd, 1/2-13 x 1 1/2 in. (2)	11	Oil filter cap gasket
12	Nut, lock, 1/2 in. (6)	13	Suction oil filter
14	Locking plate (3)	15	Drive screw (6)
16	Nut, lock, 1/2-13 x 1 3/4 in. (4)	17	Gasket
17	Nut, lock, 1/2-13 (4)	18	Hydraulic drain adapter
18	Nut, lock, 1/2 in. (4)	19	Short nipple, 1 x 2 in. (2)
19		20	Elbow, 1 in.
20			Boom base

Figure 6-27—Continued.

This section contains repair instructions for the complete traction drive. The pneumatic drill contains two complete traction drives (one for each traction unit), which are identical except for orientation, and quantities specified throughout this section are for one traction drive.

6-79. Removal

Remove the complete traction drive as described in paragraph 5-17a.

6-80. Disassembly

a. *Complete Traction Drive.* Disassemble complete traction drive in the numerical sequence as illustrated on figure 6-28. Note the following special procedures:

- (1) After draining the hydraulic oil by removing magnetic plug (1, fig. 6-28) and pipe plugs in bottom of gear housing (53) and propelling air motor (10), remove screws (7), nuts (8), and lock washers (9), and carefully pull the propelling air motor off the shaft of motor pinion gear (12).
- (2) Remove casing cover (14). Remove and discard both motor case gaskets (13).
- (3) Remove motor pinion gear spacer (11), and pull out motor pinion gear (12). If motor pinion ball bearing (41) comes out with the gear, remove the bearing using a suitable bearing puller to bear on the inner race only.
- (4) Using retaining ring pliers, remove retaining rings (15), and pull the assembled planet gears (18), ball bearings (17), and retaining rings (16) off the stubs of drive shaft (42).

Note. The ball bearings are press-fit into the planet gears, and should not be removed unless replacement is required.

- (7) Insert two 5/8-11 tpi bolts (26) into the holes in the top of the housing (27), and pull out the retaining washers (24), and the cover (25), with the lock nut (21) attached.
- (8) Loosen jam nut (30) and turn the shaft setscrew (29) to release pressure on the trunnion assembly (89).
- (9) Remove brake band (87).
- (10) Remove bolt (82), lock washer (83), and bearing (84).
- (11) Remove brake cylinder (85) from the cylinder case (86).
- (12) Remove brake band (87) from the housing.
- (13) Using retaining ring pliers, remove retaining ring (40) from the end of the shaft (42), with the motor pinion ball bearing (41) pulled out of gear housing (53). The bearing is installed in the housing with an internal bearing lock.
- (14) If necessary for replacement, remove retaining ring (43) from the end of the shaft ball bearing (42) from the bore in gear housing (53). Use bearing pusher to remove the outer race of the bearing.
- (15) Drive out roll pin (44) from clutch lock pin handle (45).
- (16) Drive out roll pin (44) from clutch spring cap (46) and main bearing parts.

b. *Propelling Air Motor.* Disassemble propelling air motor in the numerical sequence as illustrated on figure 6-29. Note the following special procedures:

- (1) Remove one cylinder (47) and cylinder gasket (48).
- (2) Rotate crank assembly (49) until the

...removable with the fingers.

- (3) Remove piston ring (16) and oil regulating ring (17) from piston (18).
- (4) Repeat the above procedure until all pistons are removed.
- (5) Pull the entire crank (26 through 39) out of motor case (48). If necessary, tap the face of the motor case with a mallet to free ball bearing (89) from its bore.

Note. If the crank parts cannot be removed, first remove rotary valve (24) as described in steps 10 and 11. Then insert a hardwood arbor through rotary valve bushing (41), and drive out the crank.

- (6) Remove cotter pin (27) and castellated nut (28). Drive out crank lock pin (29).
- (7) Separate valve end crank (80) from pin end crank (87).

Note. These parts are matched and must not be replaced individually.

- (8) Remove connecting rod rings (33), connecting rods (34), connecting rod bushing (32), and crank pin sleeve (31).
- (9) If necessary to remove ball bearings (26 and 39), use a suitable bearing puller to remove them from the crank.
- (10) Remove valve chest cover (21).
- (11) Screw a 1 1/8-inch threaded bolt into the tapped hole in the exposed rotary valve (24). Pull the bolt to remove the rotary valve.

Note. Do not remove valve chest (40) unless necessary to replace rotary valve bushing (41).

- (12) To remove valve chest (40), screw two 5/8-11 threaded bolts (at least 4 inches long) into the tapped holes

out of the valve chest using a suitable arbor.

Caution: Be careful not to shear off bushing key (42). Make sure that the arbor clears the key during removal.

6-81. Cleaning

Clean all parts with an approved solvent, and blow dry with compressed air.

6-82. Inspection and Repair

a. Inspect all parts for wear and damage. Refer to table 4-1 for permissible wear measurements.

b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

c. Inspect casing cover (14, fig. 6-28), brake piston (27), brake cylinder (37), drive shaft (42), and gear housing (53) for cracks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove nicks and burrs with a fine file or handstone, and retap or rechase all damaged threads. Replace if unserviceable.

d. Inspect all bearings for cracks, looseness, and wear. Replace if unserviceable.

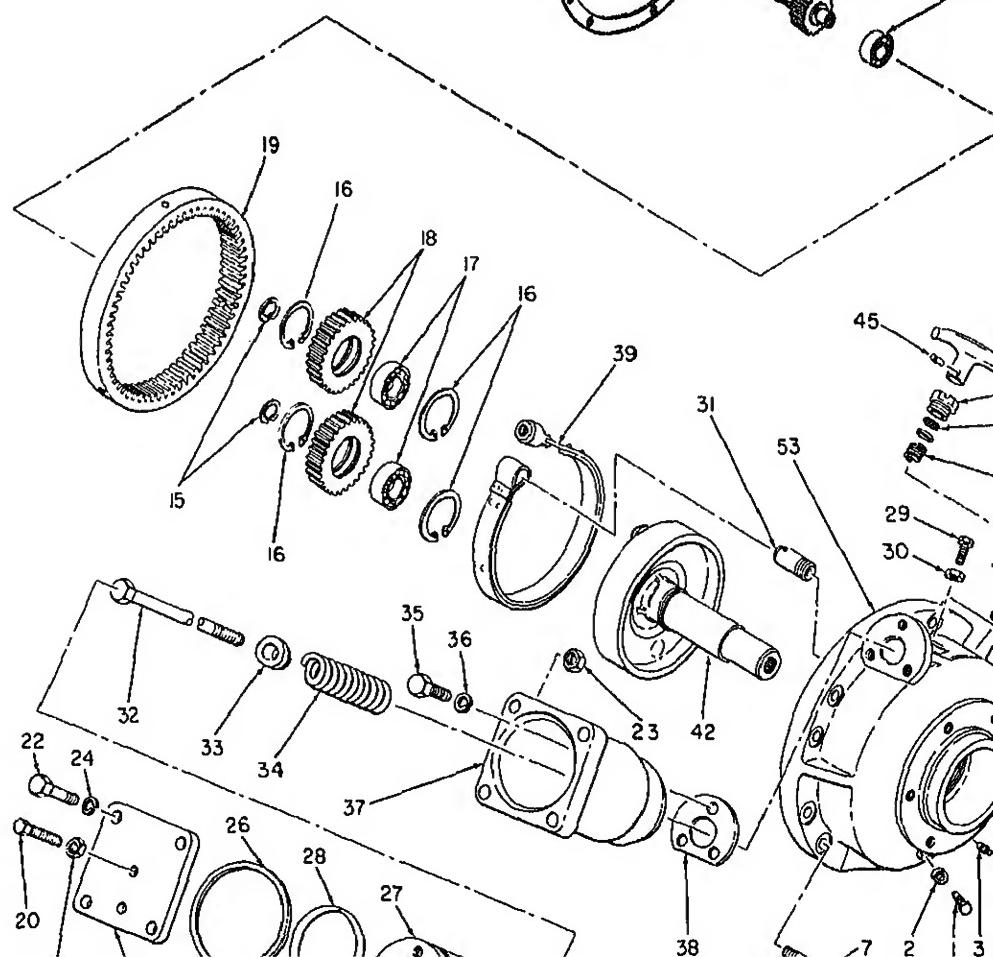
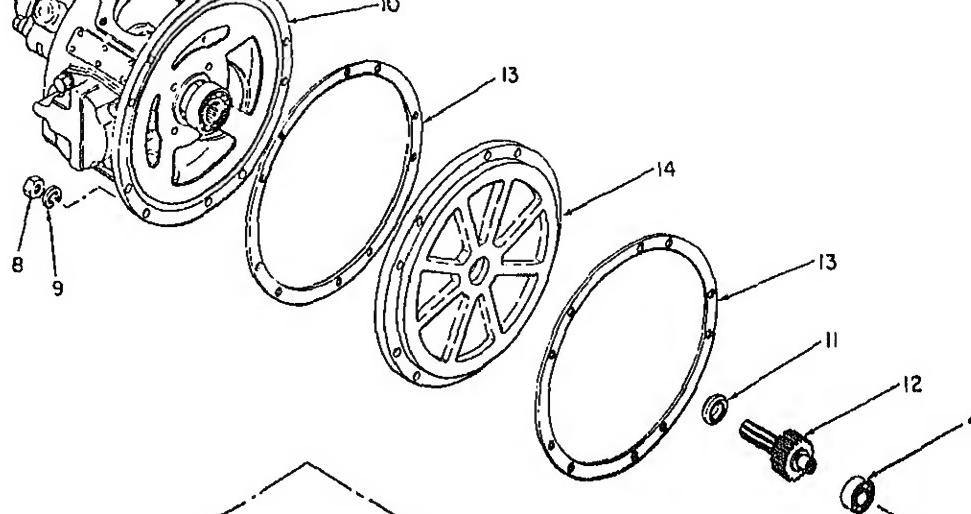
e. Inspect motor pinion gear spacer (11) for scoring marks and wear. Replace if damaged.

f. Inspect all gears and pinions for cracks, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of a part.

g. Inspect brake band assembly (39) for wear and damage. Replace if unserviceable.

6-83. Reassembly

a. *Propelling Air Motor.* Reassemble propelling air motor in reverse of numerical sequence as illustrated on figure 6-29. Note the following special procedures:



one assembly (either left-hand or right-hand).
 .
 magnetic plug, 3/4-16
 asket
 pipe plug, sq-hd, 1/2 in.
 ut, hex, 6/8-11 (6)
 washer, lock, 5/8 in. (6)
 stud, 5/8-11 x 3 in. (6)
 crew, cap, hex-hd, 1/2-13 x 2 1/2 in. (9)
 ut, hex, 1/2-18 (9)
 washer, lock, 1/2 in. (9)
 ropelling air motor
 otor pinion gear spacer
 otor pinion gear
 otor case gasket (2)
 asing cover
 etaining ring (2)
 etaining ring (4)
 all bearing (2)
 planet gear (3)
 nternal gear
 setcrew, hex-hd, 1/2-18 x 2 in.
 um nut, hex, 1/2-18
 crew, cap, hex-hd, 5/8-11 x 2 in. (4)
 ut, hex, 6/8-11 (4)
 asher, lock, 5/8 in. (4)

- | | |
|----|--|
| 28 | O-ring |
| 29 | Brake shaft setscrew, 1/2-13 x 1 1/4 in. |
| 30 | Jam nut, hex, 1/2-13 |
| 31 | Brake band anchor pin |
| 32 | Bolt, machine, hex-hd, 3/4-10 x 8 1/2 in. |
| 33 | Brake spring washer |
| 34 | Brake spring |
| 35 | Screw, cap, hex-hd, 1/2-18 x 1 1/4 in. (8) |
| 36 | Washer, lock, 1/2 in. (8) |
| 37 | Brake cylinder |
| 38 | Brake cylinder case gasket |
| 39 | Brake band assembly |
| 40 | Retaining ring |
| 41 | Motor pinion ball bearing |
| 42 | Drive shaft |
| 43 | Retaining ring |
| 44 | Drive shaft ball bearing |
| 45 | Roll pin |
| 46 | Clutch lock pin handle |
| 47 | Roll pin |
| 48 | Clutch spring cap |
| 49 | Clutch lock pin |
| 50 | Spring |
| 51 | Spring washer |
| 52 | O-ring |
| 53 | Gear housing |

Figure 6-28—Continued.

Note. Pin end crank (37) and valve end crank (30) are matched parts and must not be intermixed. Make sure that both pieces have identical identification marks.

- 2) Install connecting rod bushing (32) over crank pin sleeve (31).
- 3) Install connecting rod rings (33) and connecting rods (34) so that the rods fit between the bushing and rings.
- 4) Join the valve end crank (30) with pin end crank (37), inserting the tang on crank pin sleeve (31) in the crank slot.
- 5) Align lock pin holes in the crank sections, and drive crank lock pin (29) into position from the larger end of the tapered hole. Strike the larger end of the lock pin to make sure that it is seated properly and install gas

pusher to bear on the inner races of the bearings.

- (7) Only if the rotary valve bushing (24) was removed, install bushing (42) in valve chest (40). Align slot in the rotary valve bushing with the key, and press in the bushing with the valve chest supported, until the bushing is flush with the outside of the valve chest cover (valve chest cover) supported face down.

Note. If the rotary valve bushing is not carefully installed, it will not be necessary to ream out the inside diameter.

- (8) Check the fit of rotary valve (24) and rotary valve bushing (41). If tight, lap the valve to a good running fit, using a fine grit lapping compound with an abrasive that will not break up rapidly. If

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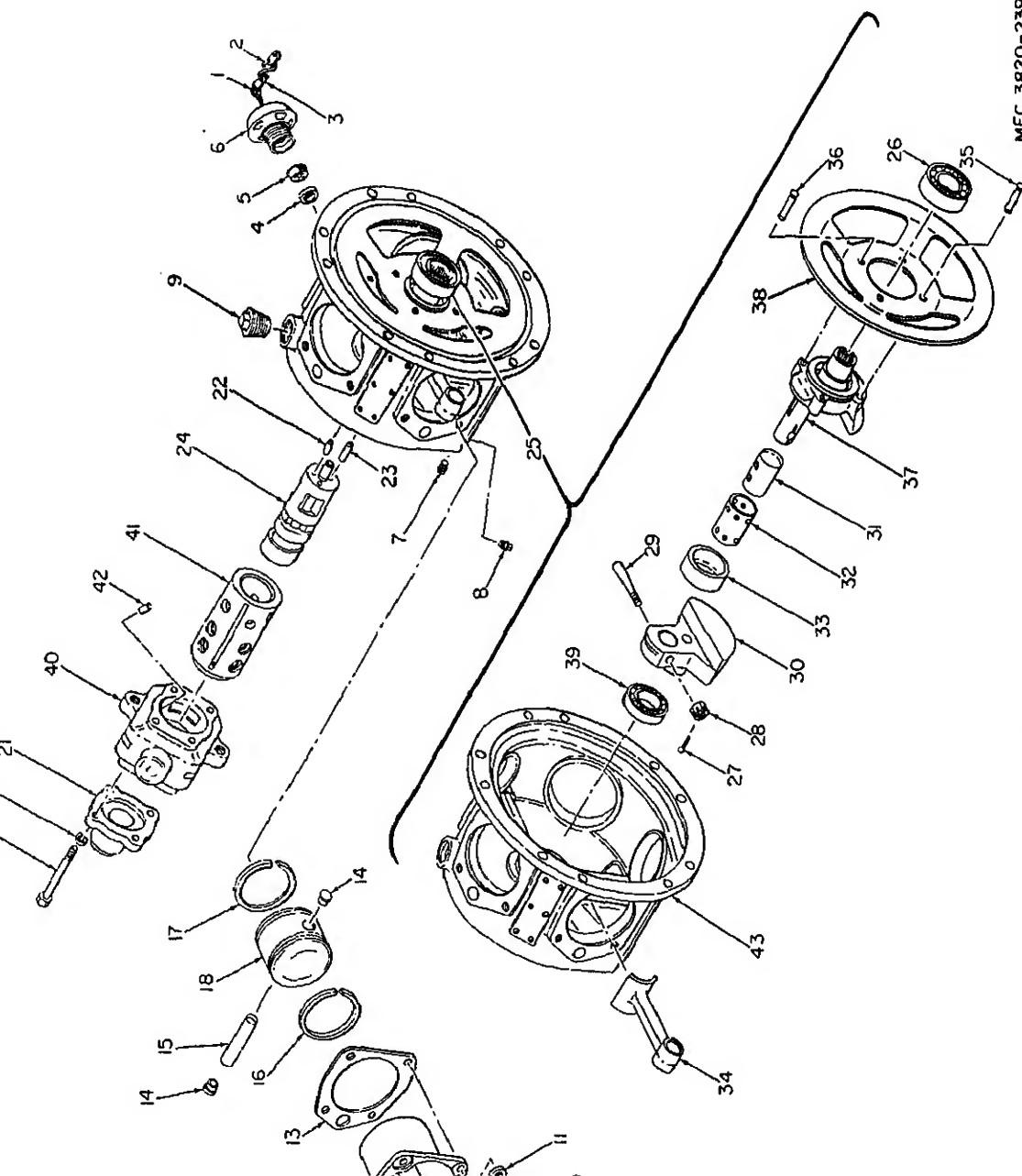


Figure 6-29. Propelling air motor, extended view.

chain	18	Piston (5)
retainer	19	Valve chest screw, hex-hd, 3/8-16 x 4 in. (4)
screen	20	Washer, lock, 3/8 in. (4)
g, 1/4 in. (2)	21	Valve chest cover
g, 3/4 in.	22	Dowel pin, 0.3125 dia x 1 in. (2)
g, 1/4 in.	23	Dowel pin, 0.375 dia x 1 1/4 in
g, 1/4 in.	24	Rotary valve
cap, hex-hd, 1/2-13 x 1 in. (20)	25	Crank assembly
flat, 1/2 in. (20)	26	Ball bearing
(5)	27	Cotter pin
gasket (5)	28	Nut, castellated, hex, 1/2-20
in cap (10)	29	Crank lock pin
in (6)	30	Valve end crank
	33	Connecting rod ring (2)
	34	Connecting rod (6)
	35	Oil splash rivet, 2 1/2 in. (2)
	36	Oil splash rivet, 3/4 in. (2)
	37	Pin end crank
	38	Oil splash
	39	Ball bearing
	40	Valve chest
	41	Rotary valve bushing
	42	Bushing key
	43	Motor case

Figure 6-29—Continued.

removed, and insert the rotary valve into rotary valve bushing (41).

(10) Install valve chest cover (21).

(11) Align bolt holes in valve chest (40) with those in motor case (43), and press the projecting end of rotary valve bushing (41) into the motor case.

(12) Make sure that the bushing enters the motor case bore squarely (with the bolt holes alined) and press the valve chest on until it contacts the motor case.

Note. Support the open end of the motor case during this operation.

(13) Align the holes in the end of valve end crank (80) with the dowel pins of rotary valve (24), and install the assembled crank assembly into motor case (43). Make sure that ball bearing (39) is seated properly in the motor case.

(14) Rotate the crank until one of the connecting rods is at top dead center. Place a piston (18) over this rod and secure with wrist pin (15) and wrist pin caps (14).

(15) Using a suitable piston ring compressor to hold oil regulating ring (17) and piston ring (16) compressed, install cylinder (12) with cylinder gasket (13) over piston (18) and into the cylinder wall in motor case (43). Secure with screws (10) and washers (11).

(16) Repeat steps 14 and 15 until all pistons and cylinders are installed.

(17) Install all plugs and caps.

b. *Complete Traction Drive.* Reassemble complete traction drive in reverse of numerical sequence as illustrated on figure 6-28. Note the following special procedures:

Note. Coat gears, bushings, bearings, etc. with

grease.

(2) Press motor pinion ball bearing (4) into the recess in drive shaft (42). Insert the drive shaft into gear housing (53), tapping with a mallet to seat the drive shaft shoulder against drive shaft ball bearing (44). Using retaining ring pliers, install retaining ring (40) in the shaft groove.

(3) Lay brake band assembly (39) around drive shaft (42) so that the trunnion can be inserted in the hole leading to brake cylinder (87). Insert brake band anchor pin (81) through the loop in the brake band assembly and screw it into the tapped hole in gear housing (53), until the end of the pin is slightly below the upper shoulder of the brake band assembly.

(4) Insert brake shaft setscrew (29). Back off setscrew 1/2 turn and tighten jam nut (30).

(5) Install brake cylinder (87) with brake cylinder case gasket (38).

(6) Mount brake spring washer (88) and brake spring (34) on bolt (32), and install the bolt to the required distance for proper brake adjustment (para 8-38).

(7) Install O-ring (28) on brake piston (27) and install in the brake cylinder (87). Install brake cylinder cover (25) and brake cylinder gasket (26). Install setscrew (20) and jam nut (21). Turn the setscrew in until it contacts the piston. Back off 1/8 turn and secure the jam nut. Apply 60 psi air pressure through a 1/4-inch hose nipple connected to the release port in the brake cylinder cover, and make sure the brake can be rotated by hand.

(8) Install clutch parts (45 through 52)

gear so that the lock pin fits into one of the holes in the gear.

- (9) If ball bearings (17) were removed from planet gears (18), use a suitable bearing pusher to bear on the outer races, and press the bearings into the gears. Using retaining ring pliers, install four retaining rings (16) in the planet gear grooves.
- (10) Install assembled planet gears (18) and ball bearings (17) onto the stubs of drive shaft (42). Using retaining ring pliers, install retaining rings (15) in the stub grooves, to lock the planet bearings in place.
- (11) Insert motor pinion gear (12) between the planet gears until meshed, and press or tap the gear into motor pinion ball bearing (41) installed in the bore of drive shaft (42).
- (12) Insert screws (7) through gear hous-

ing (52). Place a motor case gasket (13) over the screws, install case cover (14), and place another motor case gasket (13) over the screws

Note. Install casing cover (14) so the raised portion is facing outward, is perpendicular to the clutch lock handle.

- (13) Install assembled propelling air tor (10), and secure with lock washers (9) and nuts (8).
- (14) Install pipe plug (3) and magneto plug (1) with gasket (2).
- (15) Install studs (6).

Note. If the traction drive is to be stalled immediately, do not install washers (5) and nuts (4).

6-84. Installation

Install the complete traction drive as described in paragraph 5-17b.

Section XIII. MAIN FRAME AND TRACK ASSEMBLY

6-85. General

This section contains repair instructions for the main frame and track assembly. This assembly forms the basic structure for the pneumatic drill, on which all of the various units are mounted. In addition, the lubricating oil reservoir is an integral part of the frame.

6-86. Disassembly

Disassemble main frame and track assembly in the numerical sequence as illustrated on figure 6-30. Note the following special procedures:

- a. Only if necessary to remove traction units (3, fig. 6-30), use a hoist to remove the weight of the frame from the traction units. Remove bolts (1) and nuts (2) to free the traction units from the frame.
- b. Only if necessary to remove tow hitch

bum) under the frame to collect the rock dust oil from the reservoir, and remove magneto drain plug (7) with gasket (8) from the bottom of the reservoir.

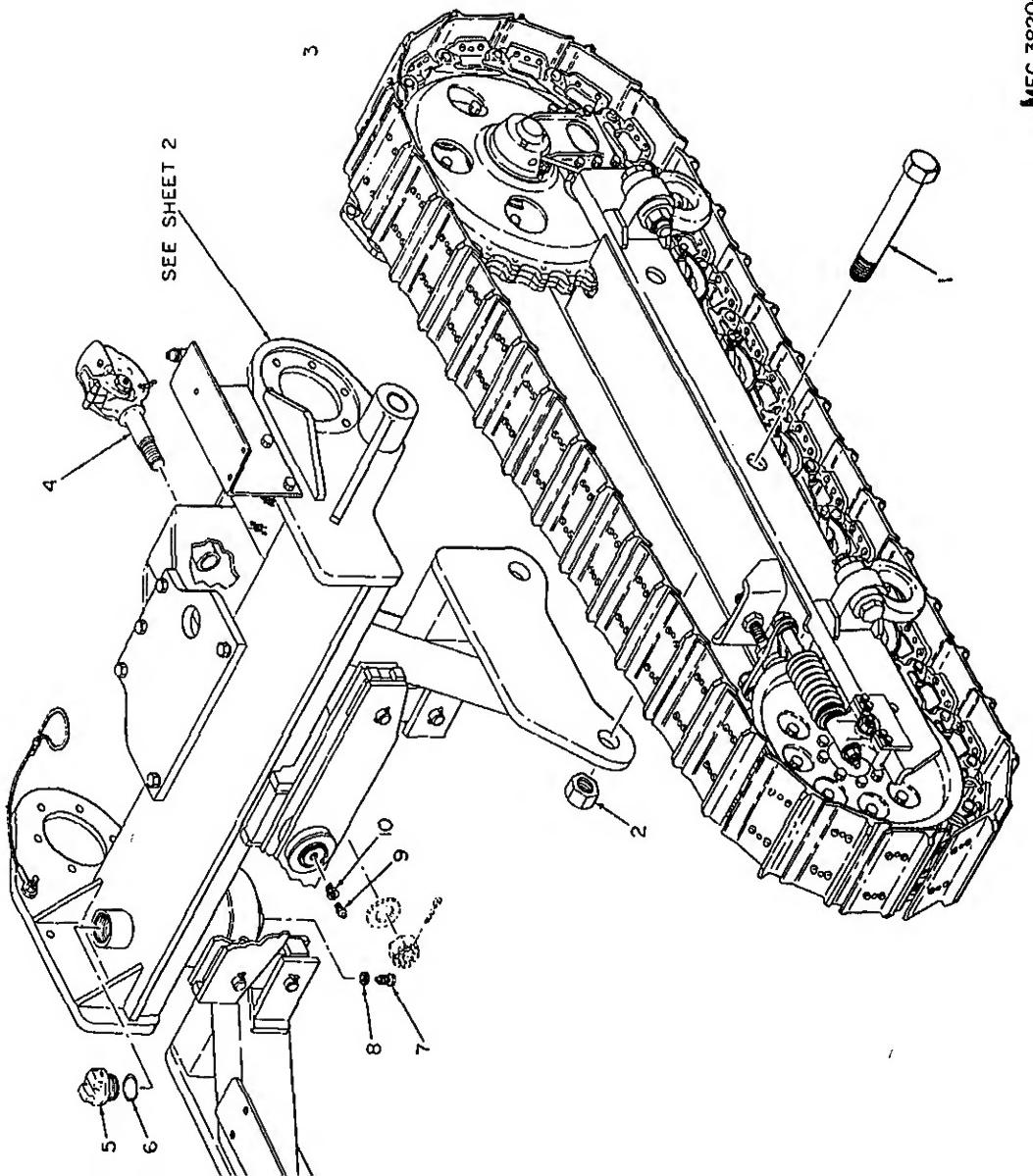
- d. Remove remaining parts only as necessary.

6-87. Cleaning

Clean all parts with an approved solvent and blow dry with compressed air.

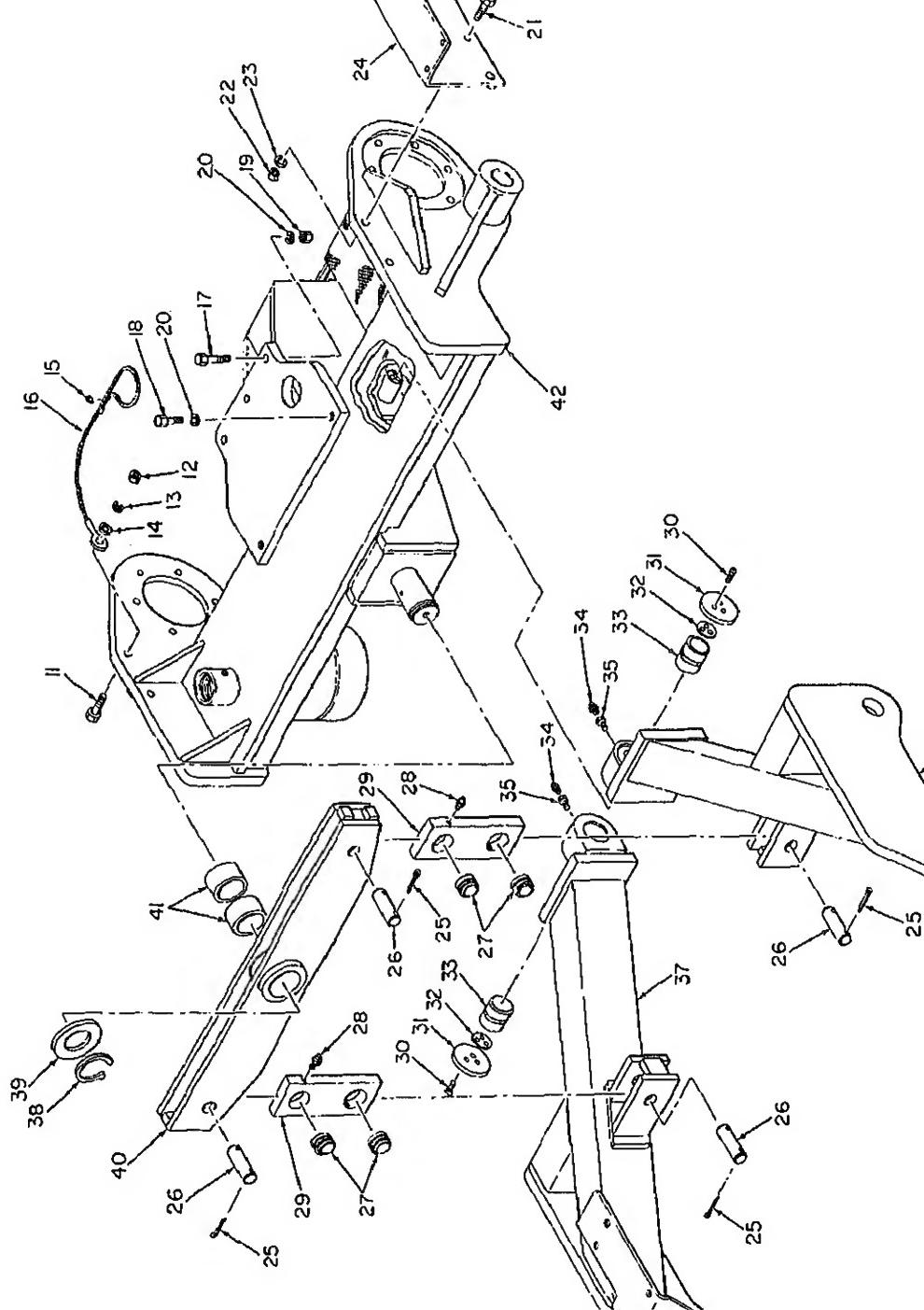
6-88. Inspection and Repair

- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.



- 10 Reducing bushing, 1/4 to 1/8 in.
O-ring
Magnetic drain plug, 3/4-16
Gasket
, hitch
- machines, hex-hd, 1 3/4-8 x 16 in. (4)
hex, 1 3/4-5 (4)
ction unit (2)

Figure 6-30.—Continued.



r, lock, 5/8 in.	24	Hydraulic valve mounting bracket
r, flat, 5/8 in.	25	Cotter pin (8)
scope clip	26	Strut suspension link pin (4)
se connection safety cable	27	Self-aligning bushing assembly (4)
machine, hex-hd, 1-8 x 3 1/4 in. (3)	28	Lubrication fitting (4)
machine, hex-hd, 1-8 x 2 1/4 in. (2)	29	Suspension link (2)
ex 1-8 (3)	30	Screw, cap, socket-hd, 7/16-20 x 1 in. (6)
r, lock, 1 in. (5)	31	Strut retainer (2)
cap, hex-hd, 5/8-11 x 2 1/4 in. (2)	32	Strut shaft spacer (4)
	33	Reducing bushing, 1/4 to 1/8 in. (2)
	34	Strut, lh
	35	Strut, rh
	36	Retaining ring
	37	Yoke retaining washer
	38	Yoke
	39	Yoke bushing (2)
	40	Bare frame

Figure 6-30 (2)—Continued.

This section contains repair instructions for traction units. The pneumatic drill uses two traction units, which are identical except for orientation, and quantities specified throughout this section are for one unit. All illustrations used depict the left-hand traction unit.

-91. Removal

Remove the traction units as described in paragraph 6-86.

-92. Disassembly

a. General. Disassemble traction unit in the numerical sequence as illustrated on figure -31. Note the following special procedures:

b. Track Assembly.

- (1) If necessary to remove track assembly (5, fig. 6-31), tow or propel the pneumatic drill until the track hookup pin (7) is at the rear, approximately half-way up the sprocket wheel of the final drive assembly (52).
- (2) Pry out track hookup pin lock pins (6).
- (3) Using a drift of a smaller diameter than the track hookup pin (7) and a backup plate to support the grouser, drive out the track hookup pin with a hammer.
- (4) Remove the track assembly either by hoisting the entire unit, or by propelling it until the track is free.

c. Track Roller Assemblies.

- (1) Remove the track assembly (para 6-92b).
- (2) Jack up the frame to allow clearance for track roller removal.
- (3) Remove self-locking nuts (19) (4 per roller), and lower the entire track roller assembly (23), with track roller

- (5) Remove oil seals (26) by cutting them with a small sharp chisel and prying out.
- (6) Pry off snap rings (27). Remove lubrication fittings (24) and reduce bushings (25).
- (7) Support the assembly on flange hub assembly (31). Using a hammer and a piece of bronze protect the shaft, drive out track roller bushing retainers (28).

Note. Remove the retainer closest to the lubrication fitting first.

- (8) If necessary to remove track roller bushings (29), drive a small chisel down along the split line, being careful not to damage any parts.

d. Track Idler Assembly.

- (1) Remove the track assembly (para 6-92b).
- (2) Remove nuts (16) and slide the track idler assembly and related parts off track frame channel assembly (53).
- (3) Remove self-locking nuts (54) from track roller adjusting forks (55).
- (4) Remove self-locking nuts (56), slide out assembled buffer spring parts (57 through 60).
- (5) After removing support guide plates (63) and track idler supports (64), remove oil seals (75) by cutting them with a small sharp chisel and prying out.
- (6) Pry off snap rings (76).

Note. If necessary to remove track idler flanges (74), be sure to first remove lubrication fittings (68) and reduce bushings (69).

- (7) Support the assembly so that the idler shaft (79) can be driven out. Install a nut (65) on the shaft to

nal Drive Assembly.

Remove the track assembly (para 6-92b).

After removing outer and inner support brackets (42 and 51), jack up the frame and remove final drive assembly (52).

Note. Use a chain hoist to support the final drive assembly.

Remove sprocket stud nuts (88) and lift out sprocket assembly (90) with collets (89) attached.

Remove hardware (93 through 97) and bearing retainer (98) with bearing retainer shims (99). Tie the shims together to facilitate reassembly.

Remove screws (100), dowel screws (101), cover plate assembly (106), and cover gasket (103). Discard the cover gasket.

Remove dust shield (104) from cover plate assembly (106) and tap out large oil seal (105).

Install a cap screw in the tapped hole of main drive shaft pinion (109). Using a pry bar and a support block, remove main drive shaft pinion (109) with complete inner and outer bearings (107 and 108) from shaft and spacer housing (110). Using a suitable bearing puller, remove the bearings from the pinion.

Note. Bearings (107, 108, 114, and 115) consist of two pieces each; an outer race and an inner race with roller, which are removable separately, but which are matched to each other and must be kept together. Do not intermix bearing races.

Remove track sprocket bearing shims (92) from shaft and spacer housing (110). Tie the shims together to facilitate reassembly.

assembly (117).

- (11) Tapping lightly with a blunt-nosed drift, remove small oil seal (112), oil seal retainer (113), and complete outer ring gear bearing (114) from the hub of ring gear and hub assembly (117).
- (12) Tapping lightly with a blunt-nosed drift, remove complete inner ring gear bearing (115) from the hub of ring gear and hub assembly (117).

6-93. Cleaning

Clean all parts with an approved cleaning solvent and blow dry with compressed air.

6-94. Inspection and Repair

a. Inspect all parts for wear and damage, and replace if necessary.

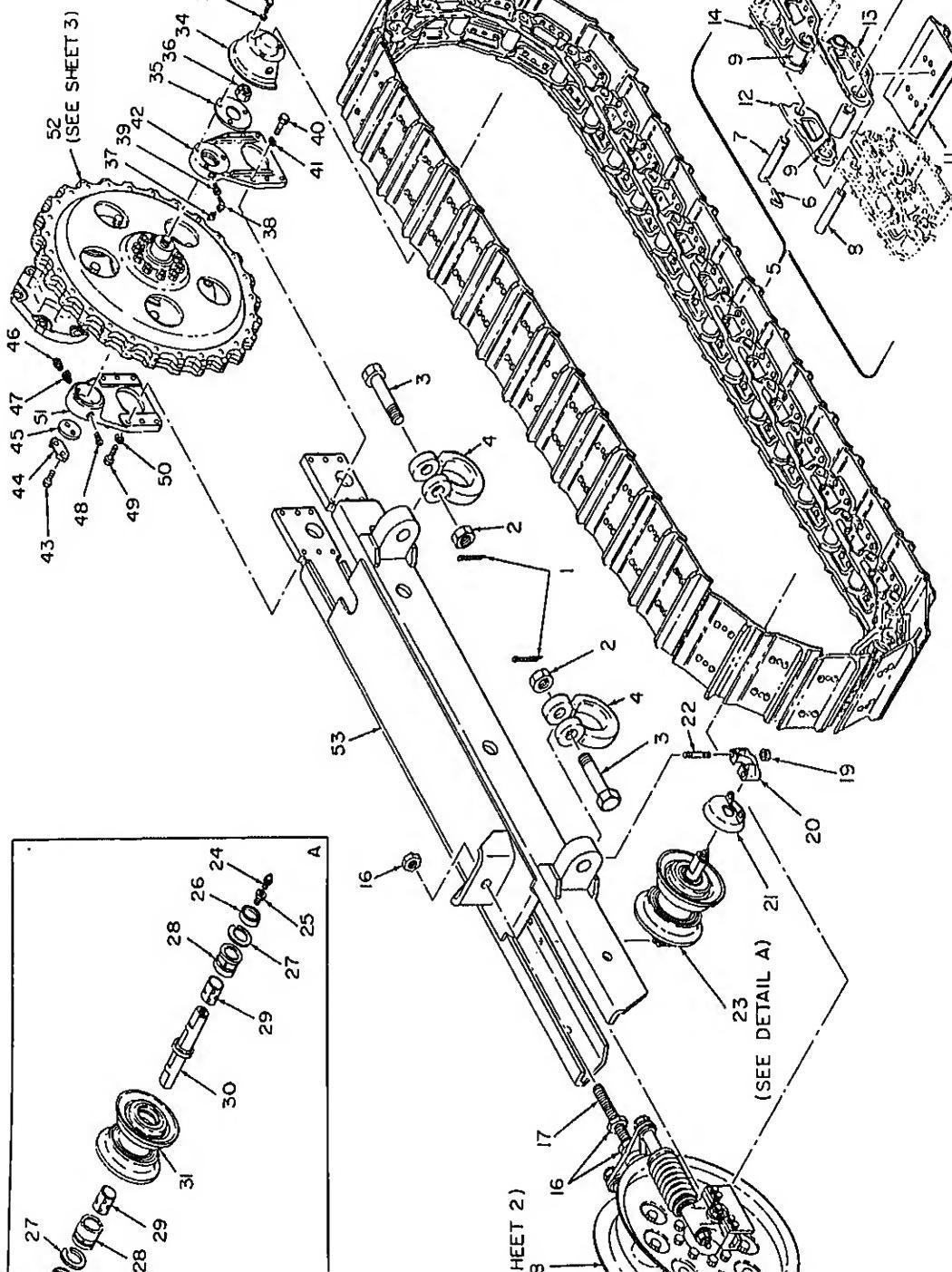
b. Inspect shaft and spacer housing (110, fig. 6-31), cover plate assembly (106), bearing retainer (98), track idler shaft (79), track idler supports (67), support guide plates (63), and buffer spring clamp rods (60) for cracks, nicks, and burrs on machined surfaces, and for stripped or crossed threads. Remove all minor nicks and burrs with a fine file or handstone, and retap or rechase all damaged threads. Replace the parts if damage cannot be repaired.

c. Inspect all gears and pinions for cracks, chipped teeth, damaged bores, and excessive wear. Replace if in doubt as to the serviceability of any part.

d. Inspect all bearings for cracks, looseness, and wear. Replace if unserviceable.

e. Inspect oil seals, wear plates, and oil seal retainers for scoring marks and excessive wear. Replace all unserviceable parts.

f. Inspect all hardware for damage threads. Retap or rechase threads if stripped or crossed, or replace if unserviceable.

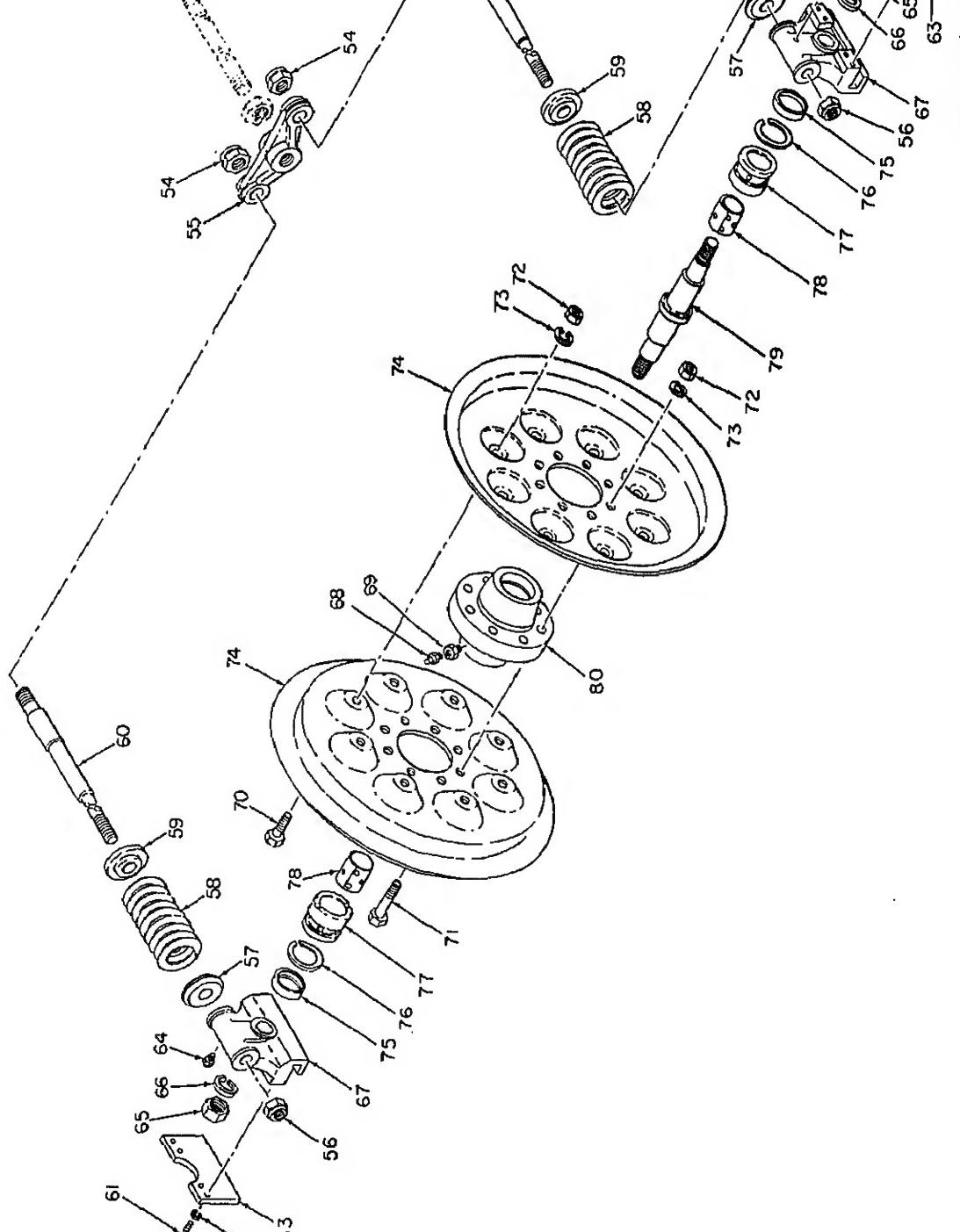


Note. This figure applies to both the left-hand and right-hand traction units, which are identical except for orientation. Quantities specified are for one unit (either left-hand or right-hand traction unit).

- 1 Cotter pin (2)
- 2 Nut, hex 1 3/8-6 (2)
- 3 Screw, cap, hex-hd, 1 3/8-6 x 6-5/16 in. (2)
- 4 Lifting and tie-down shackle (2)
- 5 Track assembly
- 6 Track hookup pin lock pin (2)
- 7 Track hookup pin
- 8 Track link pin (35)
- 9 Track link bushing (36)
- 10 Rivet (144)
- 11 Grouser (36)
- 12 Track hookup link, rh
- 13 Track hookup link, lh
- 14 Track link, rh (35)
- 15 Track link, lh (35)
- 16 Nut, hex, 1 1/8-7 (3)
- 17 Track idler adjusting screw
- 18 Track idler assembly and related parts
- 19 Nut, self-locking, hex, 1/2-20 (20)
- 20 Track roller shaft support (10)
- 21 Dust shield assembly (10)
- 22 Roller to track frame stud, 1/2-20 (20)
- 23 Track roller assembly (5)
- 24 Lubrication fitting (5)

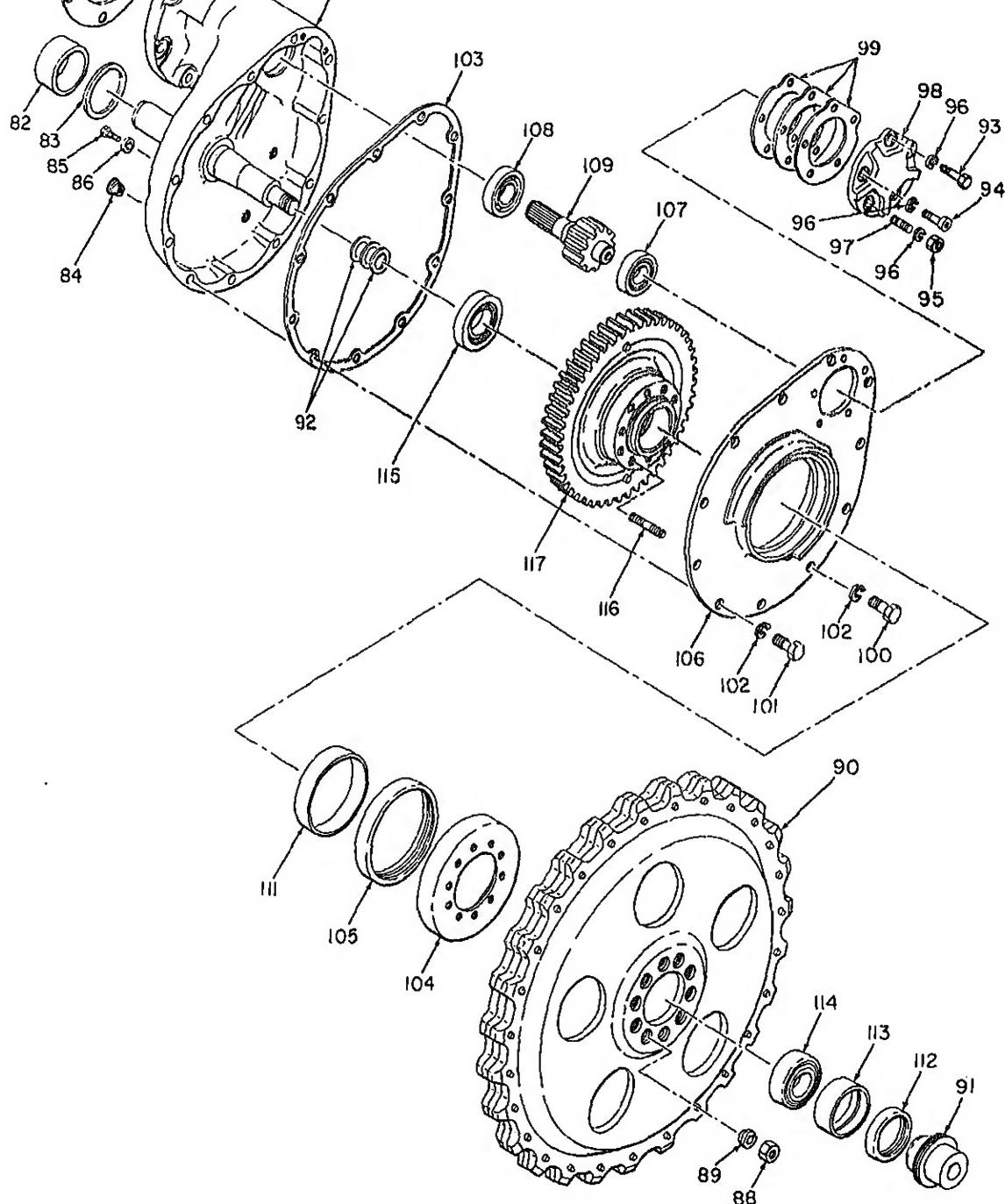
- 25 Bedding bushing (5)
- 26 Oil seal (10)
- 27 Snap ring (10)
- 28 Track roller bushing retainer (10)
- 29 Track roller bushing (10)
- 30 Track roller shaft (5)
- 31 Flange and hub assembly (5)
- 32 Screw, cap, hex-hd, 5/16-18 x 5/8 in.
- 33 Washer, lock, 5/16 in. (3)
- 34 Dust shield
- 35 Dust shield gasket
- 36 Nut, hex, 1-14
- 37 Lubrication fitting
- 38 Elbow
- 39 Reducing bushing, 1/4 to 1/8 in.
- 40 Screw, cap, hex-hd, 1/2-13 x 1 3/4 in.
- 41 Washer, lock, 1/2 in. (6)
- 42 Outer support bracket
- 43 Screw, cap, hex-hd, 1/2-13 x 1 in. (1)
- 44 Lock plate
- 45 Track frame shaft retainer
- 46 Lubrication fitting
- 47 Reducing bushing, 1/4 to 1/8 in.
- 48 Pipe plug
- 49 Screw, cap, hex-hd, 1/2-13 x 2 in. (1)
- 50 Washer, lock, 1/2 in. (6)
- 51 Inner support bracket
- 52 Final drive assembly (lh shown, rh
- 53 Track frame channel assembly

Figure 6-31(1).—Continued.



55	Track idler adjusting fork	64	Lubrication fitting
56	Nut, self-locking, hex, 3/4-16 (2)	65	Nut, hex, 1-12 (2)
57	Buffer spring front seat (2)	66	Washer, lock, 1 in. (2)
58	Buffer spring (2)	67	Track idler support (2)
59	Buffer spring rear seat (2)	68	Lubrication fitting
60	Buffer spring clamp rod	69	Reducing bushing, 1/4 to 1/8 in.
61	Screw, cap, hex-hd, 3/8-16 x 1 1/2 in. (8)	70	Screw, cap, hex-hd, 1/2-20 x 1 1/2 in. (8)
62	Washer, lock, 3/8 in. (8)	71	Screw, cap, hex-hd, 1/2-20 x 2 3/4 in. (8)
		73	Washer, lock, 1/2 in. (1)
		74	Track idler flange (2)
		75	Oil seal (2)
		76	Snap ring (2)
		77	Track idler bushing reta
		78	Track idler bushing (2)
		79	Track idler shaft
		80	Track idler hub

Figure 6-91(2)—Continued.



magnetic drain plug, 1/2 in.	104	Cover gasket
socket	105	Dust shield
oil filler plug	106	Large oil seal
market stud nut (10)	107	Cover plate assembly
blk. (10)	108	Complete outer bearing
track sprocket assembly	109	Complete inner bearing
haft trunnion	110	Main drive shaft pinion
ack sprocket bearing shims (as rqr)	111	Shaft and spacer housing (lh shown rh opposite)
rew, cap, hex-hd, 3/8-16 x 1 1/4 in. (2)	112	Oil seal wear plate
rew, cap, hex-hd, 3/8-24 x 1 in. (2)	113	Small oil seal
nt, hex, 3/8-24	114	Oil seal retainer
asher, lock, 3/8 in. (5)	115	Complete outer ring gear bearing
ud, 3/8-24 x 15/16 in.	116	Complete inner ring gear bearing
aring retainer	117	Track sprocket stud (10)
aring retainer shim (as rqr)		Ring gear and hub assembly

Figure 6-31(3)—Continued.

6-81. Note the following special pro-
cess:

Final Drive Assembly.

Press large oil seal (105, fig. 6-31), into cover plate assembly (106), with the lip facing outward.

Press small oil seal (112) into the deep bore of oil seal retainer (113), with the lip facing the shallow bore of the retainer.

Tap or press the outer races of outer and inner ring gear bearings (114 and 115) into the hub of ring gear and hub assembly (117).

Tap or press the outer race of inner bearing (108) into the bore of shaft and spacer housing (110).

Using a suitable press and bearing pusher to bear on the inner races, install bearings (107 and 108) on main drive shaft pinion (109).

Tap or press the inner race and rollers of outer and inner ring gear bearings (114 and 115) in place on shaft and spacer housing (110).

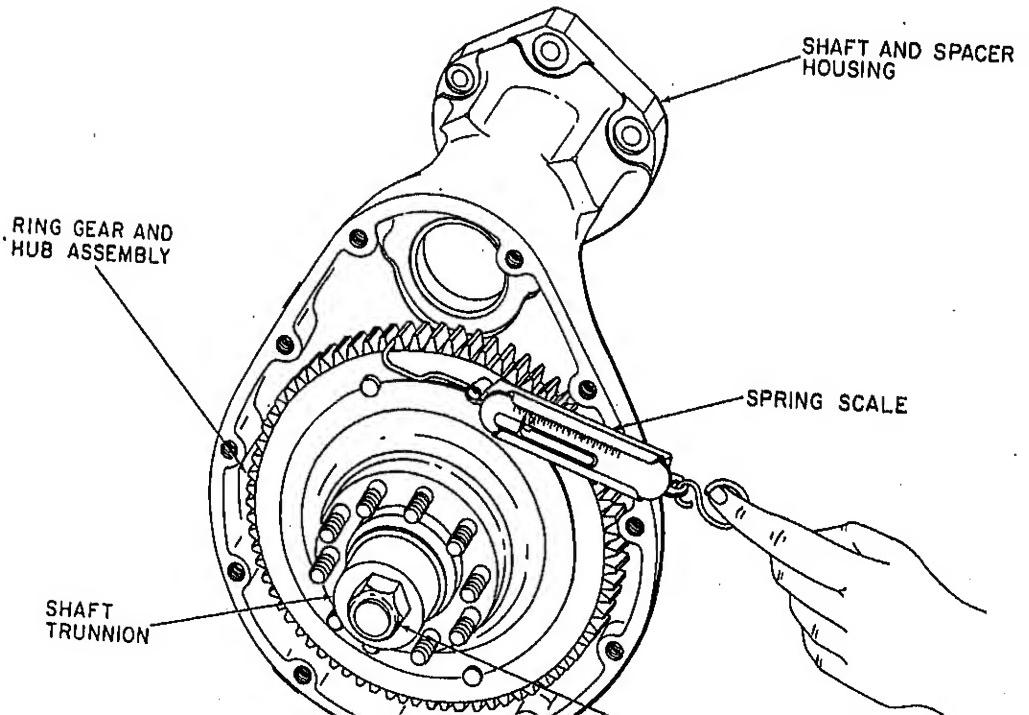
Install ring gear and hub assembly (117) into shaft and spacer housing (110).

and spacer housing (110). Install the assembled small oil seal (112) and oil seal retainer (113) on the shaft. Install shaft trunnion (91) and secure with nut (36).

Note. If the shim thickness used previously cannot be determined, start with 0.125 inch thickness of shims.

- (9) Engage the hook of a spring scale in a tooth of ring gear and hub assembly (117) as shown in figure 6-32 and check the pull against rotation of the gear. If the spring scale does not read between 6 to 8 pounds, add or remove track sprocket bearing shims (92, fig. 6-31) as required to obtain the correct reading.
- (10) Carefully install oil seal wear plate (111) on the rim of ring gear and hub assembly (117), tapping the plate in place with a piece of wood. Be careful not to damage the plate.
- (11) Install the assembled main drive shaft pinion (109) with bearings (107 and 108), into shaft and spacer housing (110).
- (12) Align a new cover gasket (103) with

- (102).
- (13) Loosen nut (36) enough to allow ring gear and hub assembly (117) to turn freely.
 - (14) Install the same thickness of bearing retainer shims (99) as was removed during disassembly, over cover plate assembly (106). Install bearing retainer (98) and hardware (98 through 97).
- Note. If the shim thickness used previously cannot be determined, start with 0.050 inch thickness of shims.*
- (15) Wrap some string around the protruding (splined) end of main drive shaft pinion (109) and hook a spring scale on the string to check the pull against rotation of the main drive shaft pinion. If the drag is not be-
 - (16) Remove nut (36) and shaft seal (91). Install the assembly seal (112) and oil seal retainer so that the deep bore corner oil seal is facing outward (end of the shaft). Tap or oil seal retainer until seal is seated. Install the shaft trunnion (97) and bearing (36). Tighten the nut securely.
 - (17) Install dust shield (104), sprocket assembly (90) and (89). Install and tighten the two stud nuts (88) to a torque of 100 pounds.
- Note. After 100 hours of operation, check and retighten the sprocket to the specified torque.*
- (18) Jack up the frame and install drive assembly (52) and related parts.



- 1) Using a mallet, tap track idler bushing retainers (77) and track idler bushings (78) into track idler hub (80).
- 2) Install track idler shaft (79). Install snap rings (76) and oil seals (75).
- 3) If track idler flanges (74) were removed, install them on track idler hub (80). Tighten screws (70 and 71) evenly to make sure that the wheel will run true. Install reducing bushing (69) and lubrication fitting (68).
- 4) Install track idler supports (67) and support guide plates (63).
- 5) Install buffer spring parts (54 through 60).
- 6) Jack up the frame and install track assembly and related parts (18), with track idler adjusting screw (17) and nuts (16).
- 7) Check the assembled length of buffer springs (58) on both traction units to insure correct running alignment of the wheels. Set the assembled length of both buffer springs to 6 1/8 inches.

Track Roller Assemblies.

- 1) Using a vise and a hard wooden block, press track roller bushings (29) into track roller bushing retainers (28) so that the oil holes are aligned.
- 2) Using a suitable bearing driver, install the assembled bushings and retainers into flange and hub assembly (31), with the tapered ends toward

- ping with a mallet if necessary to avoid binding.
- 4) Using a suitable bearing driver, oil seals (26) in place with the lips of the seals facing outward.
- 5) Install dust shield assemblies (25). Jack up the frame and install track roller shaft supports (20) with track roller assemblies (23), on track frame studs (22). Secure with self-locking nuts (19).

e. Track Assembly.

- (1) Loosen track adjusting nuts (16) as necessary.
- (2) Jack up the frame and mount track around the final drive sprocket, track idler, and track rollers, bringing the ends together.
- (3) Align the pin holes of left- and right-hand track hookup links (13 and 14) with a drift.
- (4) With track link bushing (9) installed and the outer track hookup pin located with pin (6) inserted in track hookup link (7), place the hookup pin through the hookup links and bushing.
- (5) Turn the track hookup pin (7) so that the holes are aligned with the slots in the link.
- (6) Insert and drive the track hookup pin lock pin (6) completely in until seated.
- (7) Adjust the tracks (para 3-36a).

6-96. Installation

See figure 6-30 and install the traction unit.

Section XV.

TOW HITCH

6-98. Removal

Remove the tow hitch as described in paragraph 3-40.

General

This section contains repair instructions for the tow hitch. The tow hitch may be used for

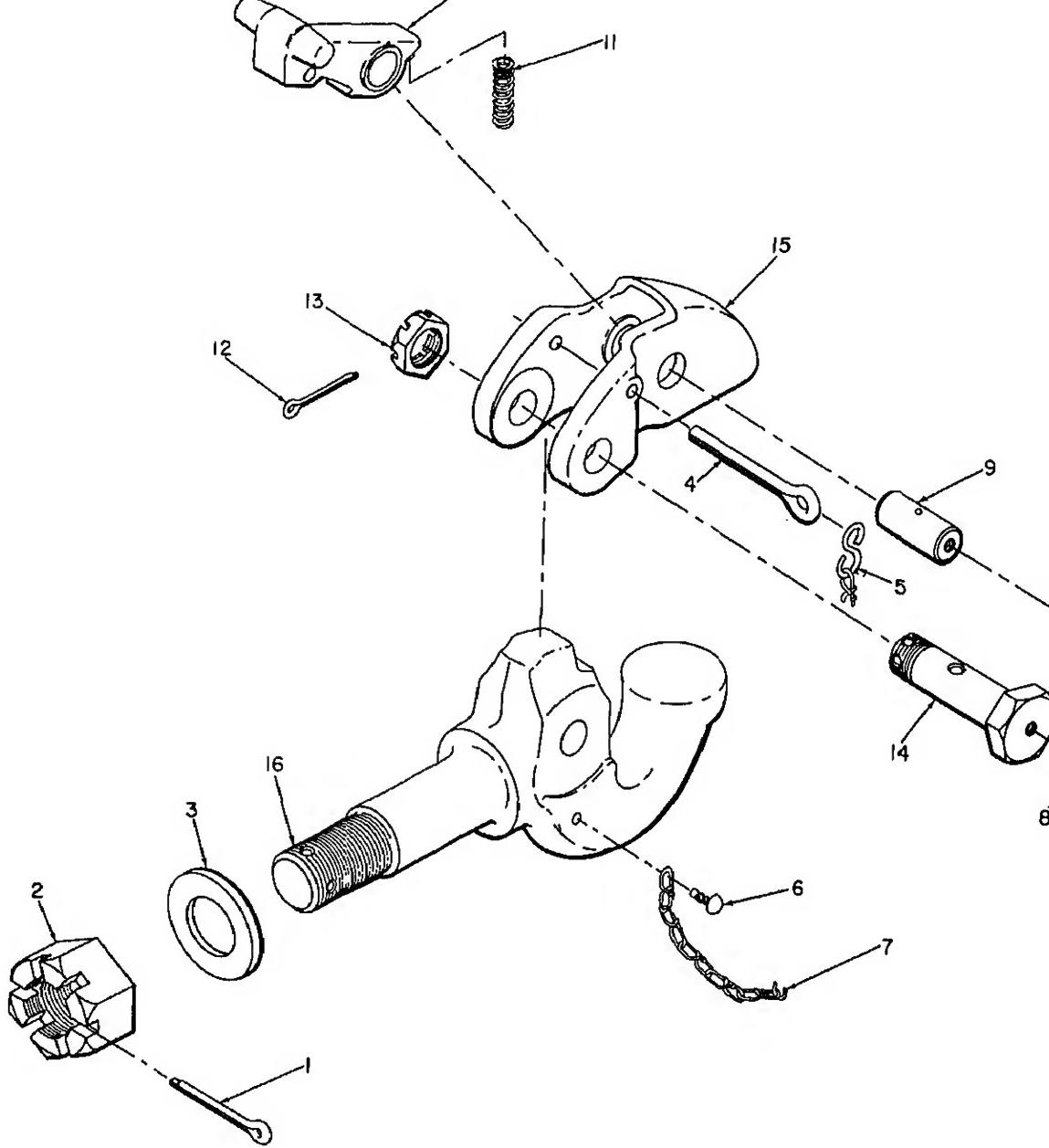
- a. Inspect all parts for wear and damage.
- b. Inspect all hardware for damaged threads.

Retap or rechase threads if stripped or crossed,
or replace if unserviceable.

cal sequence as illustrated on figure 6-

6-103. Installation

Install the tow hitch as described in
graph 8-41.



S-link	18	Nut, hex, slotted, 1-14
Drive screw	14	Latch bolt, hex-hd, 1-14 x 8 7/8 in.
Chain	15	Pintle lock
Lubrication fitting (2)	16	Pintle

Figure 8-33—Continued.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200- Hand Portable Fire Extinguishers For Army Users
10

A-2. Lubrication

C9100IL Fuels, Lubricants, Oils and Waxes
LO 5-3820-239- Department of the Army Lubrication Order for Drill, Present and Future
12 Crawler Mounted, Self-Propelled Ingersoll-Rand Model C MIL-L-2105A

A-3. Painting

TM 9-218 Painting Instructions for Field Use

A-4. Radio Suppression

TM 11-483 Radio Interference Suppression

A-5. Maintenance

TM 88-750 Army Equipment Record Procedures
TM 5-3820-239- Department of the Army Operator, Organizational, Direct and General Support, and Depot Maintenance Manual
15
TM 5-3820-239- Department of the Army Operator and Organizational Maintenance Repair Parts and Special Tools List Manual
20P
TM 5-3820-239- Department of the Army Direct and General Support and Depot Maintenance Repair Parts and Special Tools List Manual
85P
TM 5-764 Electric Motor and Generator Repair

A-6. Shipment and Storage

TB 740-93-2 Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TB 740-93-3 Administrative Storage of USAMEC Mechanical Equipment

APPENDIX B

BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

Section I. INTRODUCTION

3-1. Scope

This appendix lists items which accompany the pneumatic drill or are required for installation, operation, or operator's maintenance.

3-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items—Section II is a list of items which accompany the pneumatic drill or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies—Section III is a listing of maintenance and operating supplies required for initial operation.

3-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. *Source, Maintenance, and Recoverability Codes (SMR), Column (1):*

(1) Source Code, indicates the selection status and sources for the listed item. Source codes are:

Code	Explanation
	of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked so can be assembled by units at indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the majority of which is normally below that of the applicable end item, and the failure of which should result in retirement of end item from the supply system.
X1	Applied to repair parts which are not procured or stocked, the requirement which will be supplied by use of next higher assembly or component.
X2	Applied to repair parts which are stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
C	Applied to repair parts authorized for local procurements. If not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.
G	Applied to major assemblies that are procured with PEMA (Procurement Equipment Missile Army) funds for individual issue only to be used as exchange assets.

turned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. *Federal Stock Number, Column (2).* This column indicates the Federal stock number for the item.

c. *Description, Column (3).* This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. *Units of Issue, Column (4).* This column indicates the unit used as a basis for issue, e.g., pr, ft, yd, etc.

e. *Quantity Incorporated in Unit Pack, Column (5).* This column indicates the actual quantity contained in the unit pack.

f. *Quantity Incorporated in Unit, Column (6).* This column indicates the quantity of the item used in the functional group.

g. *Quantity Furnished With Equipment, Column (7).* This column indicates the quantity of an item furnished with the equipment.

- (1) *Figure Number, column 9a.* Indicate the figure number of the illustration in which the item is shown.
- (2) *Item Number, column 9b.* Indicate the callout number used to refer to the item in the illustration.

B-4. Explanation of Columns in the Table of List of Maintenance and Operating Supplies—Section III

a. *Component Application, Column 1.* This column identifies the component application of each maintenance or operating supply item.

b. *Federal Stock Number, Column (2).* This column indicates the Federal stock number for the item and will be used for requisitioning purposes.

c. *Description, Column (3).* This column indicates the item and brief description.

d. *Quantity Required for Initial Operation, Column (4).* This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. *Quantity Required for 8 Hours Operation, Column (5).* This column indicates the estimated quantities required for an average eight hours of operation.

f. *Notes, Column (6).* This column indicates informative notes keyed to data appearing in a preceding column.

B-5. Federal Supply Code for Manufacturers

Code	Manufacturer
30760	Ingersoll-Rand Co. New York, New York
88038	Alemite Corp. Long Island City, New York
93343	Oliver Corp. Charles City, Iowa

Section II. BASIC ISSUE ITEMS LIST

(C) R	(2) Federal Stock No.	(3) Description	(4)	(5)	(6)	(7)	(8)
			Unit of issue	Qty inc in unit pack	Qty furn with equip	Qty smith	(A) F/F N
		GROUP 31—BASIC ISSUE ITEMS MANUFACTURER INSTALLED.					
		3100—BASIC ISSUE ITEMS MANUFACTURER OR DEPOT INSTALLED.					
	7510-839-3494	Binder, loose Leaf: U.S. Army Equipment Log Book	Ea		1	1	
	7520-559-9618	Case, Maintenance and Operational Manuals, cotton duck, water repellent, mildew resistant, MIL-B-11743B.	Ea		1	1	
		Department of the Army Organizational, Direct and General Support, and Depot Maintenance Manual, TM 5-3820-239-15.	Ea		1	1	
		Department of the Army Operator and Organizational Maintenance Repair Parts and Special Tools List Manual, TM 5-3820-239-20P.	Ea		1	1	
		GROUP 32—BASIC ISSUE ITEMS, TROOP INSTALLED.					
		3200—BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED.					
		Wrench, Track Adjusting (93343) 112659	Ea		1	1	
		Wrench, 1 inch Open End (30760) 1013	Ea		1	1	
		Wrench, 1 5/16 inch Open End (30760) 8A	Ea		1	1	
		Gun, Grease (88033) 4040	Ea		1	1	
		Gun, Oil (88033) 4032	Ea		1	1	
		Hose Assembly, Grease Gun (88033) 6652A	Ea		1	1	

Section III. MAINTENANCE AND OPERATING SUPPLIES

Part ent ation	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6)
1		Lubricating Oil Gear: 5 gal drum as follows:			Notes
	9150-577-5844 (2)	GO-90	3 qt	(3)	(1) Includes quanti- ty gear oil for b- units.
	9150-257-5440 (2)	GOS	3 qt	(3)	(2) See C91001L fo- rational data at questing pro-
Hydraulic oil	9150-265-9428 (2)	Oil, Lubricating: 5 gal pail as follows: OEID	40 qt (4)	(3)	(3) See current L.C. grade applica- replenishment vals.
	9150-242-7603 (2)	OES	40 qt (4)	(3)	(4) Reservoir capac- ity.
	9150-265-9435 (2)	Oil, Lubricating: 5 gal pail as follows: OE 30	8 qt (4)	(5)	(5) Average oil con- sumption is 1 qt per of operation.
	9150-265-9428 (2)	OE 10	8 qt (4)	(5)	
	9150-242-7603 (2)	OES	8 qt (4)	(5)	
Oilfold labor		Lubricating Oil Gear: 5 gal drum as follows: GO-90			
	9150-577-5844 (2)	GOS			
Feed s		Oil Lubricating 5 gal drum as follows: OE-30			
	9150-265-9435 (2)		2 qt	(3)	
	9150-265-9428 (2)	OE-10	2 qt	(3)	
		Grease, Molybdenum			

(1) Item number and description	(2) Federal stock number	(3) Description	(4) Quantity required 1/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
Points	9150-190-0955 (2)	Grease, automotive and artillery: 5 lb can as follows: GAA			(3)

APPENDIX C

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

1. General

- a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.
- b. Section II designates overall responsibility for the performance of maintenance operations on the identified end item or component. The implementation of the maintenance tasks upon the end item or component will be consistent with the assigned maintenance operations.
- c. Section III lists the special tools and test equipment required for each maintenance operation as referenced from section II.
- d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

—2. Explanation of Columns in Section II

a. *Functional Group Number.* The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the Maintenance Assignment in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. *Component Assembly Nomenclature.* This column contains a brief description of the components of each functional group.

c. *Maintenance Functions and Maintenance*

tions for the various maintenance categories are as follows:

C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

The maintenance functions are defined as follows:

A—INSPECT:	Verify serviceability and detect incipient electrical or mechanical failure by close visual examination.
B—TEST:	Verify serviceability and detect incipient electrical or mechanical failure by measuring mechanical or electrical characteristics of the item and comparing those characteristics with authorized standards. Tests will be made commensurate with test procedures with calibrated tools and test equipment referenced in the Maintenance Assignment.
C—SERVICE:	Operations required periodically to keep the item in proper operating condition, i.e., clean, preserve, drain, prime and replenish fuel, lubricate, hydraulic, and deicing fluid or compressed air supplies.
D—ADJUST:	Regulated periodically to prevent malfunction. Adjustments will be made commensurate with adjustment procedures and associated equipment adjustment specifications.
E—ALINE:	Adjust two or more components on electrical or mechanical alignment.

F—CALIBRATE:	Determine, check, or rectify the graduation of an instrument, weapon, or weapons system or components of a weapons system.	each component part and assembling using service rebuilt, or new assemblies, and parts
G—INSTALL:	Remove and install the same item for service or when required for the performance of other maintenance operations.	<i>d. Reference Note.</i> This column, subdivided into columns L and M, is provided for referencing the Special Tool and Test Equipment Requirements (sec. III) and Remarks (sec. IV) that may be associated with maintenance functions (sec. II).
H—REPLACE:	Substitute serviceable components, assemblies and subassemblies for unserviceable counterparts.	
I—REPAIR:	Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skills, including welding, grinding, riveting, straightening, adjusting and facing.	<i>a. Reference Code.</i> This column consists of a number and a letter separated by a dash. The number references the Tools and Equipment requirements column on the Maintenance Assignment. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the Maintenance Assignment.
J—OVERHAUL:	Restore an item to a completely serviceable condition (as prescribed by serviceability standards developed and published by the commodity commands) by employing techniques of "Inspect and Repair Only As Necessary" (IROAN). Maximum use of diagnostic and test equipment is combined with minimum disassembly during overhaul. "Overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul as applied to end items, is limited to depot maintenance level.	<i>b. Maintenance Category.</i> This column shows the lowest level of maintenance authorized to use the special tool or test equipment.
K—REBUILD:	Restore to a condition comparable to new by disassembling to determine the condition of	<i>c. Nomenclature.</i> This column lists the name or identification of the tool or test equipment. <i>d. Tool Number.</i> This column lists the manufacturer's code and part number, or Federal stock number of tools and test equipment.

C-3. Explanation of Columns in Section I

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the Tools and Equipment requirements column on the Maintenance Assignment. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the Maintenance Assignment.

b. Maintenance Category. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal stock number of tools and test equipment.

C-4. Explanation of Columns in Section I

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column M and the second letter references a maintenance operation, columns L through K.

b. Remarks. This column lists information pertinent to the maintenance operation being performed, as indicated on the Maintenance Assignment section II.

	Component assembly nomenclature	DISP/BK	TEST	SERVICE	ADJUST	ALINE	CALIBR	INSTAL	REPLAC	REPAIR	OVERHA	REBUIL	Tools and equipment	Ref
11	REAR AXLE													
1108	Final Drive -----	C	--	--	--	--	--	--	F	F				
13	TRACKS													
1801	Suspension System:													
1802	Suspension assembly, track -----	C	--	--	--	--	--	--	F	F				
	Track Support Rollers and Brackets:													
	Roller assembly, support bushings -----	C	--	--	--	--	--	--	F	F				
1803	Track Idlers and Brackets:													
1804	Idler assembly, track adjuster -----	C	--	--	--	--	--	--	F	F				
1805	Track Drive Sprocket:													
	Sprocket, drive -----	C	--	--	--	--	--	--	F	F				
1905	Track Assembly													
	Plate, assembly -----	C	--	--	--	--	--	--	F	F				
15	FRAME													
1501	Frame Assembly:													
	Deck assembly -----	C	--	--	--	--	--	--	F	F				
	Crossbar, struts -----	C	--	--	--	--	--	--	F	F				
1503	Towing Attachments:									O				
	Hitch, towing -----	C	--	--	--	--	--	--	O					
22	BODY CHASSIS OR HULL, AND ACCESSORY ITEMS													
2210	Data Plates:													
	Plates, data -----	C	--	--	--	--	--	--	F	F				
	Plates, instruction -----	C	--	--	--	--	--	--	F	F				
48	HYDRAULIC													
4801	Hose, Pipe Fittings, Tubing:													
	Hose and fittings -----	C	--	--	--	--	--	--	O	O				
	Tender assembly, hose support -----	C	--	--	--	--	--	--	O	O				
4802	Pump and Pump Drive:													
	Coupling, flexible -----	C	F	--	--	--	--	--	O	O				
	Pump, hydraulic -----	C	--	--	--	--	--	--	O	O				
4805	Manifold and/or Control Valves:													
	Valve, master control -----	C	--	--	--	--	--	--	O	O				
	Valve, knee action and turret swing -----	C	--	--	--	--	--	--	O	O				
4807	Hydraulic Cylinders -----	C	--	--	--	--	--	--	O	O				
4808	Reservoir -----	C	--	C	--	--	--	--	O	O				
50	PNEUMATIC EQUIPMENT													
5006	Lubrication System:													
	Cap and fill tube -----	C	--	--	--	--	--	--	O	O				
	Plug, drain -----	--	--	--	--	--	--	--	O	O				
	Lubricator, air line -----	--	--	--	C	--	--	--	O	O				
5008	Air Intakes:													
	Hoses, fittings, manifolds -----	C	--	--	C	--	--	--	O	O				
	Strainer, air -----	C	--	--	C	--	--	--	O	O				
	Valve, shut-off -----	C	--	--	C	--	--	--	O	O				
5019	Pneumatic Motor Assembly:													
	Drill assembly, drifter, -----	C	--	--	C	--	--	--	O	F				

A

B

			INSPECT	TEST	SERVICE	ADJUST	ALINE	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERRHAUL	REBUILD	Tools and equipment	Ref
	Component assembly nomenclature														
019	Pneumatic Motor Assembly:														
	Motor, feed	F	-								O	F			
	Gear case, feed motor	F	-	C							F	F			
	Gear case, trammimg motor	F	-	C							F	F			
	Clutch, throw-out, trammimg motor	-	-	-	-	-	-	-	-	-	F	F			
020	Governor Pneumatic Motor:										O	F			
	Control, feed motor	F	-	-	-	-	-	-	-	-	O	F			
	Control, trammimg motor	F	-	-	-	-	-	-	-	-	O	F			
	Control, drifter rotation	F	-	-	-	-	-	-	-	-	O	F			
	EARTH MOVING EQUIPMENT COMPONENTS														
473	Lift and Swing Mechanism:														
	Bearing plate, turret	C	-	-	-	-	-	-	-	-	F				
	Boom assembly	C	-	-	-	-	-	-	-	-	F				
	Dumpcrank assembly	C	-	-	-	-	-	-	-	-	F				
	Pin, boom bushing	C	-	-	-	-	-	-	-	-	F				
	Pin, dump cylinder and turret	C	-	-	-	-	-	-	-	-	O				
	Turret	C	-	-	-	-	-	-	-	-	F				
476	Feed and Leveling:														
	Carriage assembly	-	-	-	-	-	-	-	-	-	F	F			
	Centralizer	-	-	-	-	-	-	-	-	-	O	O			
	Chain	-	-	-	-	O	-	-	-	-	O	O			
	Slide, drill mounting	C	-	-	-	-	-	-	-	-	O	O			
	Sprockets, chain	C	-	-	-	-	-	-	-	-	O	O			
	Sprocket, gear case	F	-	-	-	-	-	-	-	-	F	O			
477	Hand Control and Linkage:														
	Control, assembly, pump	C	-	-	-	-	-	-	-	-	O	O			
	Cables, hand control	C	-	-	-	-	-	-	-	-	O	O			
	Levers, hand control	C	-	-	-	-	-	-	-	-	O	O			

Section III. SPECIAL TOOL AND TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
		No special tools or test equipment required.	

Section IV. REMARKS

Reference code	Remarks
A — A	Service only
B — H	Parity includes instructions on page 1-11

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For explanation of abbreviations used, see AR 320-50.